GAS JOURNAL, SEPT. 21, 1938

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Editorial Notes

Thirty Years in the Gas Industry

THE Paper by Mr. J. E. Blundell at the North British meeting, in which he set out some of his experiences and impressions of thirty years in the Gas Industry, was a fitting and useful corollary to his Communication, still fresh in our mind, to The Institution of Gas Engineers in June, 1932. The present Paper, which we publish elsewhere in this issue, covered a great deal of ground and pointed to the stability of the Gas Industry and its increasing usefulness to the nation. It indicated, too, some of the many remarkable developments which have been effected in the Industry, in its manufacturing process and in the disposal of its products, during the past thirty years. It is not our intention here to discuss *seriatim* the many points dealt with by the Author, but we may call attention to one or two of the features of a Paper which, we feel sure, will be widely read with both interest and profit.

As one so closely associated with the development of the continuous vertical retort since its inception, it was natural that Mr. Blundell should begin his Paper by reference to the strides which have been made in this method of carbonization since the first Glover-West plant was installed at St. Helens, especially since his work in connexion with it proved a turning point in his career. The figures he gave of the results of a test carried out on that plant in 1909 are remarkable in showing that the thermal yields were in line with to-day's practice. Using Durham coal, for example, a yield of over 75 therms of gas having a calorific value of 576 B.Th.U. per cu.ft. was obtained per ton of coal; and the figures set out relating to the working results at Droylsden in 1911 indicate the range of flexibility possible even before the introduction of steaming—which "revealed the great possibilities of the continuous vertical retort in this respect." The Author referred also to the advances which have been made in regard to saving of ground space since the first installations of continuous vertical retorts were erected—advances which on occasions have been instrumental in solving the problem of providing for increase of gas-making capacity without incurring the high expense of moving works to a new site or of making expensive purchases of land adjoining an existing site. He gave examples to illustrate these advances. The original plant at Macclesfield, for instance, had a capacity of 2·1 therms per day per square foot of ground space occupied. When the plant was reconstructed and modernized the capacity was raised to 2·8 therms, and when the new installation was erected in 1934 this figure was raised to 3·1. At Carlisle the original plant of 1922 had a daily capacity of 2·5 therms per square foot of ground area occupied, but in the extension installed last year this figure was raised to 3·1, while in another instance the original installation of 1912 had a daily capacity of 1·9 therms per square foot and this figure was raised to 2·6 in the extension installed in 1922, and to 3·75 in the most recent extension, that of 1936. And these developments, interesting and important in themselves, have had their influence on other systems of carbonization. They have stimulated progress in the design and operation of horizontal retorts and of intermittent chamber ovens and retorts to such an extent that it depends on the conditions of the market whether one type of plant or another can produce the cheapest therm; each type is appropriate according to the particular circumstances.

Calorific Value

THE flexibility of the continuous vertical retort brought about largely as a result of the steaming process has had another effect—that of encouraging a multiplicity of declared calorific values. The Report of the Fuel Research Board of January, 1919, which ultimately formed the basis of the Gas Regulation Act of 1920, suggested that, though gas undertakings should be free to declare the calorific value they considered to be the best and most economical in their particular circumstances, the number of standards for the declared value should be limited. The four standards suggested were 400, 433, 466, and 500 B.Th.U. per cu.ft. for the whole country. In his Paper Mr. Blundell put forward the idea of standardization, but on the values of 500, 475, 450, 425, and 400 B.Th.U. per cu.ft. From all points of view we are for greater uniformity of calorific value, and we think that three, or four, at the most, values would well suffice and would help

to eliminate the personal whim factor which still characterizes the policy of many gas engineers to-day. On practical as well as theoretical grounds we quite fail to see why there should be such variation in declared calorific values among undertakings carbonizing the same or similar types of coal in the same or similar systems of carbonizing plant.

An interesting analysis was given by Mr. Blundell of the economics of benzole recovery, emphasis being laid on the fact that its value as a revenue producer to the gas undertaking depends on the price ratio between coal and coke—at all events in the case of continuous vertical retorts where the calorific value of the gas produced is variable at will. Under proper conditions, such as a favourable market for coke and a suitable type of plant in which the recovery of benzole provides a convenient and ready means of adjusting calorific values to requirements, benzole recovery is undoubtedly a paying proposition; and there is always the attraction that benzole is readily saleable and yields a steady return on the capital outlay with low selling costs. The whole point, from the economic aspect, is that each case must be studied in the light of the particular data before a decision can be reached; but it has been amply shown that profitable benzole recovery is not confined to the large or even the medium sized works. Plant low in capital cost and requiring a minimum of labour and attention is available for the small works. And it is unnecessary for us to stress the importance of benzole recovery from the point of view of national welfare.

Tar and Tar Fog

DISCUSSING the tar market, the Author called attention to the admirable work of the British Road Tar Association in perfecting the use of tar for the making and surfacing of non-skid, durable roads low in first cost and relatively inexpensive to maintain in first-class condition. We put down the word "use" advisedly, for a satisfactory road depends not only on the appropriate type of tar but on its correct application; and the British Road Tar Association has unquestionably carried out work of the utmost value in developing this application technique and making it widely known to highway authorities and surveyors. The increased activities in connexion with road making should mean further outlets for tar. The outlook for pitch is not so good, but there are the possibilities of its use in pulverized form as a substitute for oil fuel. In connexion with the removal of tar fog from gas there was a most interesting section in the Paper dealing with the working results of an electrical detarrer at the Carlisle Gas-Works. There the plant is situated immediately after the exhausters. Mr. Blundell explained that prior to its installation the tar fog passing to the purifiers was as high as 36 grains per 100 cu.ft., but the quantity now passing is negligible. The Livesey washer and the scrubbers are now completely free from tar and, in consequence, the liquor passing to the sulphate plant has considerably improved. The detarrer has been in operation for twelve months, and during that time no new oxide has been charged to the purifiers; a decided improvement in the activity of the oxide has been observed and only six boxes have been changed since electrical precipitation was used, against nine for the same period during the previous two years. The last two boxes were worked up to a sulphur content greater by over 8% compared with previous practice, and naphthalene has been greatly reduced. A statement was given in the Paper showing the financial advantage secured—and it is substantial—by the installation of the electrical detarrer.

The Future

AND now a word about a link-up between the suggestions made in the Fuel Research Board's Report of nearly twenty years ago and the fundamental assertions advanced on more than one occasion recently by Sir David Milne-Watson. Let us turn to 1919. The Fuel Research Board then said: "The sheet anchor of the Gas Industry in the future must necessarily be its possession of the cheapest known means of distributing potential heat energy in a convenient form. For lighting and for power production the electric supply of the future may seriously contest the field with the producers of gas, but *for the supply of heat, gaseous fuel ought to remain supreme if its production and use are developed on sound lines.*" Since that time the production and use of gaseous fuel have quite definitely been developed on "sound lines"—and this, in recent years, in spite of a peculiar and not easily understandable viewpoint that the salesman of a product is somewhat of a hero while the man who makes that product saleable against competition is of negligible worth. We come to the present. "The future of the Gas Industry in domestic supply," Sir David Milne-Watson has so convincingly stated, "lies in the rationalization of fuel service for heat by the concentration of the main cooking, space heating, and water heating loads under one set of distribution costs. For some years to come a smokeless solid fuel will necessarily split the space heating loads; that fuel the Gas Industry possesses in coke." The time will come when coke—or any other smokeless solid fuel—will give way to gas, new methods of production of which are being assiduously explored. While these methods are being explored, one thing has been made sure, that the combination of gas and coke can, without additional expenditure, raise the standard of living and happiness of those of the lowest income in Great Britain to-day. In his Paper Mr. Blundell described Kensal House as a "magnificent experiment." We would add that the "experiment" is a proved fact. It is also a fact that something between 20 and 30 million tons of bituminous coal burned annually in the domestic grates of this country remains to be replaced eventually by gas, and gradually through the use of gas and solid smokeless fuel which can be produced economically in the manufacture of the more refined heat energy.

Smoke Abatement

FORTUNATELY in recent times there has been a decided movement in the nation towards clean-air mindedness, and we welcome the news that a big effort is to be made to stimulate it. The consciousness of "Britain's burning disgrace" is still comparatively in embryo, taking the country as a whole, but bright spots here and there, to which we have frequently given full credit in the "JOURNAL," portend a far wider realization of the enormous advantages of "going smokeless," and of the fact that a far greater degree of smokelessness, if not the hundred per cent. condition, is attainable as a matter of practical politics.

As recently as July 20 we discussed at considerable length the problems to be faced, and our Editorial Notes described in some detail the difficulties which have had to be faced by pioneers in this matter. In the programme for the B.C.G.A. Conference which we published last week there will have been noted, as an early item in the business, a discussion on the Association's forthcoming Smoke Abatement Campaign. Literature recently issued by the Association to members has already disclosed that this campaign will be based upon a publication by the National Smoke Abatement Society en-

titled "Britain's Burning Shame." Heralded by National Gas Fire Fortnight which is now running, this—the most powerful attack ever launched against smoke—begins this autumn.

What more compelling title could have been chosen for a book which declares war on smoke? This publication will shortly be available for general distribution, and it has been designed, written, and printed by experts in propaganda—that science which has been so highly developed in recent years, and which is applicable equally to beneficent causes as to the evil ones which at times bring it into ill-repute. In any event it means that the case will be presented in the most convincing manner possible with a wealth of facts, figures, and illustrations. The story is told clearly, interestingly, and with all the weight of scientific findings. It will make everyone who reads it realize that smoke abatement is not an empty phrase but a national duty. It brings home an appreciation of the fact that smoke abatement is not merely clearing the outside air over big cities and industrial plants, but is a real issue *inside the home*. There is no need to re-emphasize here the toll of the smoke scourge in this country. The new book does that in a very convincing way in pointing to the ravages of soot on the human frame and on buildings and decorations alike. Suffice it to repeat that the use of raw coal in domestic grates is responsible for three-quarters of our national smoke problem, which in money alone is estimated to cost over £1 per head of the population per annum.

This is undoubtedly the strongest, most realistic platform the Gas Industry has ever had, in view of its ability to contribute a solution of a social question that affects every home in Britain. On behalf of the Gas Industry—biggest suppliers of smokeless fuels—the British Commercial Gas Association have made comprehensive plans for supporting this national effort up to the hilt, and every member is urged to put the "last ounce" into backing up this effort. Already the Association have prepared a parallel booklet on "What You Can Do to Get Rid of Smoke," to assist local activities, while a full range of other publicity matter, including posters, leaflets, and Press advertisements, is ready to "go into action" in this vast campaign.

The Gas Industry is indebted to the Smoke Abatement Society for launching this campaign. For many years the Society, with most limited resources but with ample courage and perseverance, have sought—and lately with growing success—to bring about not only the public's recognition of the smoke evil, but the public's knowledge that it need not exist. Whether or not the Gas Industry has in the past sufficiently appreciated this good work, there will be ample opportunity of supporting it in the present campaign to bring about a fuller realization of a great menace to the health and amenities of life. The work of the Smoke Abatement Society is inextricably bound up with that of the Gas Industry. What the Society emphasizes by way of theory the Industry can translate into practice.

It is a campaign which we believe will find the public in receptive mood; there can be no doubt that consciousness of the smoke evil has made rapid strides in recent years. It will therefore be for each undertaking to consider what present contribution it can make in the shape of attractive terms and in other ways in order to help the movement towards smoke abolition. Any present sacrifice of this kind which it may be seen fit to make should at least result in obtaining satisfied and profitable consumers, but above all it should at length bring overdue recognition of what the Gas Industry has already done, is doing, and will continue to do in the future to improve the general standard of health and comfort, and to strike at the heart of a crying national evil.

Pressmen in a New Rôle

Occasionally, when attending meetings of Gas Companies at which the attendance of shareholders was unduly attenuated, we have suggested "in lighter vein" that a quorum might be assured by presenting members of the Press whose duty compelled them to be in attendance with a small holding of shares—a suggestion which was no doubt gratefully received, but never, so far as we are aware, acted upon. Another method, however, of making pressmen active participants in the proceedings at meetings at which their own business obliges them to be present was put forward some days ago by a Company Chairman who had conceived a thoroughly sound scheme to meet the particular circumstances of his own concern. The idea makes special appeal to us, perhaps, because of our own light-hearted suggestion for further utilizing the presence of pressmen at meetings. The Chairman to whom we refer explained that he had frequently noticed points on various company accounts which seemed to need some elucidation or comment, but which no shareholder raised. Being particularly anxious for any ambiguity in their own accounts to be ventilated, his Company had invited to the meeting a number of gentlemen from the Press who were experts in reading and interpreting balance-sheets. When he invited questions and comments from the stockholders, he proposed to include those gentlemen of the Press who had accepted the invitation of the Board to be present. We are told that on this particular occasion several journalists responded, and in all probability what they had to say was helpful. In fact, there seem to be really big possibilities in the idea—particularly if it could be arranged that the invitations should be issued for every company meeting without exception. But would they be? The addition to our own duties would in any case be slight, for Gas Company accounts and meetings are models of clarity, but we can imagine some Pressmen requiring quite a large increase in their salaries.

Stealing the Electricians' Thunder

If ever there was a more uncompromisingly electrical apparatus than the vacuum cleaner or this new-fangled machine which is claimed to give one "the perfect shave," we suppose it is (or was) the microphone. Yet, incredible as it may seem, the Institution of Electrical Engineers have only just thought to turn this essentially electrical appliance to their own needs. We learn that during the approaching session a microphone and speech amplification equipment are to be installed at the lecture table for the benefit of lecturers, authors, and speakers in discussions, a uniform speech level being maintained by means of loud-speakers. Writing in the *Electrical Times*, "Meteor" asks what his electrical *confrères* would not have given, on many occasions in past years, for a microphone at the desk of the I.E.E. President. Many words of wisdom and scientific comment of deep interest, he avers, have been lost for ever during the reading of inaugural addresses, especially in the case of Presidents who have the habit of sinking their voices to a confidential tone when approaching the most interesting items of their theses. The Gas Industry, too, we fear, cannot be absolved on all occasions from a similar indictment, while there is also the speaker who not only increases his verbal output to what seems to the reporter to be well over 200 words per minute when he reaches the most highly technical passages, but who also fails to stop speaking when he has finished all he has to say. We provided for him some years ago, however, not merely by the installation of a microphone, but by the introduction of Mr. J. R. W. Alexander's famous "traffic lights"—also, we believe, electrically-operated—to warn him that others, too, may have something to say. Here, indeed, is another idea which we freely offer our sister industry for their consideration. The Gas Industry have never hesitated to call in the aid of electricity where it has seemed advantageous to do so, and in commending the I.E.E. for following our lead, we would take the opportunity of drawing their attention to the gas-operated thermocouple which might well be adapted to provide the necessary e.m.f. for their microphone and loud-speakers at very economical rates.

Personal

JAMES RAGDALE BRADDOCK, eldest son of Mr. Robert Bates Braddock, Engineer and Manager of the Radcliffe and Little Lever Gas-Works, was married at All Saints' Church, Radcliffe, on Sept. 15, to Margaret Elizabeth, only daughter of Mr. and Mrs. Clifford Thorp, of Whitefield.

Obituary

Dr. CHARLES CARPENTER

A Personal Tribute from W. G. Head

That I served under Dr. Charles Carpenter for many years fills me with great pride. He was a marvellous man to work for. He loved putting big responsibilities on young men and he never failed to reward good service. When considering recommendations or suggestions with which, perhaps, he was not in agreement he would often say "have it your own way," and you would probably learn by the mistake made and there would be no criticism, only a friendly smile.

On one occasion, when in America and very young, I had to make an important decision, the result of which was not pleasing to the Directors; but Charles Carpenter believed that I was right and came to America to see me and proved it. Such was "the Chief" who trusted and was trusted.

I mourn his passing with grateful and affectionate memories.

From Cyril A. Hart

Apropos of the passing of Dr. Carpenter, it may be of interest to know that his father was a marine engineer and it may well be that Dr. Carpenter's genius as an engineer was inherited from him. His mother, née Blanchette, was of French Huguenot extraction, which may account for Dr. Carpenter's love of French literature and art.

Dr. Carpenter's uncle, Charles Hart, was a Director of the old Woolwich Equitable Gas Company, and he carried out most of the negotiations which resulted in the amalgamation with the South Metropolitan Gas Company. Another uncle, Blanchette, was a well-known City Actuary, and it was through his influence that Dr. Carpenter started his career with the South Metropolitan Gas Company.

I have in my possession a letter written by Dr. Carpenter in 1884 to a relative of mine. In view of the light which it throws upon his character, some excerpts from it may be of interest to your readers.

> "My success," he wrote, "dates from my return to work after the winter of 1881. Previous to then I had been on good terms with all officials, but could *not* make headway (in spite of his friendship for a very near relative), with the respected Chief whose duties I will so soon take over.
>
> "Those happy weeks at Aldeburgh braced me up with new impetus, mind and body alike, gave me fresh thoughts and fresh ideas. I went in, tried hard, and slowly and surely made *him* the greatest friend of all."

So it may be that from Dr. Carpenter's own description of his early difficulties and doubts, and how he overcame them, some of the rising generation in the Gas Industry may take fresh courage.

Letters to the Editor

Salaries in the Industry

SIR,—I have read with great interest Sir Frederick West's splendid William Young Memorial Lecture on the Education, Training, and Selection of the Technical and Administrative Personnel of the Gas Industry, and your admirable editorial comments.

I am particularly interested in this matter, as Chairman of the Lancashire District Gas Education Committee. Your review of the important question of salaries raised in the Lecture touches a vital spot, as I have been most concerned that the financial prospects of a career in the Gas Industry should be greatly improved if we are to continue to secure men of the best type in the future. A golden opportunity to put this matter on a sound foundation now presents itself in the proposed reorganization of the Industry by extending the scope of the British Gas Federation.

My suggestion is that power be taken under the proposed new Constitution of that body to set up a National Joint Industrial Whitley Council to grade and fix salaries for the whole of the professional, technical, administrative and clerical staffs of gas undertakings in the country. A Joint Industrial Whitley Council for the workmen grades is, of course, at present in being.

The setting up of such a Whitley Council would, I feel convinced, remedy for all time the disadvantages and anomalies to which your editorial and Sir Frederick West's Lecture have called such serious attention. I feel convinced that the support by the Technical Press of this proposal would greatly aid in the solving of a serious problem which is and has been for many years a matter of consideration to all concerned in promoting the welfare of our great Industry.

Yours, &c.,
F. G. SHAW.

Buxton Corporation Gas Department,
Gas Service Buildings,
Buxton,
Sept. 14, 1938.

Water Softeners and Heaters

SIR,—On returning from holiday my attention has been called to the letter in your issue of Aug. 31, from Mr. Leopold Friedman, of Ascot Gas Water Heaters, Ltd., and I would appreciate the courtesy of your columns for my reply.

After careful perusal of Mr. Friedman's letter, I can only heartily congratulate Ascots upon the production of such a phenomenal boiling water apparatus as their RS.52/1. We are surprised at the quantity of boiling water suggested as one gallon per day. Our tests by water meter were far larger. However, if their quantity is correct we would agree with Mr. Friedman as to the cost of the installation being prohibitive, and even suggest that householders would be foolish to purchase the RS.52/1 heater, let alone pay the extra for a softener.

I note Mr. Friedman's remark as to the "comparatively high price" of water softeners, and venture to suggest that Mr. Friedman is not well informed as to the price at which gas undertakings can obtain from well-known water heater makers the combined unit—boiling water sink heater and our large size softener. In any case, we have never commented on the price at which Ascots sell their heaters.

I would thank Ascots for drawing my attention to their book, and the implied suggestion as to the perfect water softener. Here again I suggest they are misinformed, as our softener actually complies with their stipulations. Also it is evident from the book in question that hard water is not conducive to high efficiency in boiling water heaters. I suggest that Ascot Gas Water Heaters, Ltd., should guarantee the RS.52/1 to carry on for 5,000 gallons boiling water before descaling on districts where the water is not over 16° to 18° of hardness, which is the degree given on testing some London water supply. Or were they referring in their test to London suburban districts where the water authority have softeners in service?

Yours, &c.,
IDEAL WATER SOFTENERS,
H. J. FREEMAN.

58, *Queen's Road,*
Watford.
Sept. 15, 1938.

Forthcoming Engagements

September.

22.—I.G.E.—Gas-Works Safety Rules Committee, 2.30 p.m.
23.—I.G.E.—Joint Lighting Committee, 2.30 p.m.
26.—L.C.C.A.—Finance Committee, 10.45 a.m.; Executive Committee, 11.15 a.m.; Central Committee, 2.30 p.m.
28.—I.G.E.—Pipes Committee, 2.30 p.m.
30.—I.G.E.—Liquor Effluents and Ammonia Committee, 11.15 a.m.; Joint Research Committee, 2.30 p.m.
30.—Wales and Mon. Juniors.—Visit to Austin Motor Company, Birmingham.

October.

1-4.—B.C.G.A.—Annual General Meeting and Conference at Brighton (for Programme see p. 34 of "JOURNAL" for July 6).
6.—I.G.E.—Research Executive Committee, 2.30 p.m.
6.—Midland Juniors.—Presidential Address of A. W. Attwood.
7.—I.G.E.—Joint Committee on Complete Gasification Under Pressure (16, Old Queen Street, S.W. 1), 3 p.m.
7.—North of England Association.—Autumn Meeting at Sunderland.
7.—Southern Association (Eastern District).—Meeting at Gas Industry House, 2.30 p.m. Discussion on A.R.P.
10.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; General Purposes Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.
11.—I.G.E.—Council, 10 a.m.
12.—I.G.E.—Board of Examiners, 2.30 p.m.
13.—Midland Association.—Autumn General Meeting, Grand Hotel, Birmingham.
18.—I.G.E.—Gas Education Executive Committee, 11 a.m.; Gas Education Committee, 2.30 p.m.

News of the Week

An Exhibition of gas appliances, with cookery demonstrations, is to be held in Lanark by the Gas Department from Sept. 27 to 30. It will be opened by Provost John Steel.

A New Kitchen which is being built at Dover Hospital is to be fitted with gas cooking apparatus. The work is to be carried out by the Dover Gas Company, and a new main has already been laid for the purpose.

In the Kitchen of the new Harpenden (Herts.) Public Hall, which will be officially opened on Sept. 28, there are two gas ovens, one double griller, and one hot closet, which have been supplied by Messrs. Benham & Son, Ltd.

Copies of the Following Recent B.S. Specification can be obtained, price 3s. 6d. each, from the Secretary, The Institution of Gas Engineers, 1, Grosvenor Place, London, S.W.1: No. 806-1938, Ferrous Pipes and Piping Installations for Land Boilers.

"Only an Apparent Increase" is how Treasurer Gibson described a revision of Renfrew gas charges. The Town Council on Sept. 12 agreed to increase the price of gas by 2½d., making the total charge 3s. 2½d. per 1,000 cu.ft. The quality of the gas, however, had been raised, and the total cost to the consumer over the whole year would actually be equivalent to a decrease.

A Party of Danish Visitors, who have been inspecting gas-works and various other departments of municipal activity in England, were received on Sept. 16 by the Lord Mayor of Nottingham (Councillor W. Hooley), and afterwards they inspected the Corporation's modern Gas-Works, being escorted by Alderman Sir Albert Ball (Chairman of the Gas Committee) and Mr. George Dixon, Engineer and Manager.

"Mr. Therm" Played a Prominent Part in the carnival procession held at Loughborough in aid of the local hospital, but unfortunately he was literally "fouled" by electricity. He came into contact with some overhead electric cables and received a nasty shock, his head being completely knocked off his shoulders. Another glaring instance of unfair competition—or, perhaps, it was "Bogey Blackout's" innate jealousy of the genial Mr. Therm.

The Industrial Gas Centres' Committee held its meeting in Glasgow on Sept. 16, when the members were entertained to lunch in the Central Hotel by the Empire Exhibition Works Committee, Mr. David Fulton (Helensburgh), Chairman, presiding and extending a welcome. Mr. Fulton paid tribute to the work of the Industrial Exhibits Committee and the Scottish Undertakings and referred appreciatively to the invaluable services of Mr. John McIsaac, Glasgow Corporation Gas Department, who had arranged and supervised the Industrial Gas Display in the Palace of Engineering. Mr. W. Dieterichs, Gas Light and Coke Company, replied, and added his tribute to Mr. McIsaac, who acknowledged the great help he had received from various Undertakings in Scotland and England who had staffed the stand. In the afternoon the party visited the works of Messrs. R. & A. Main, Ltd., Falkirk, where they were received by Mr. Wortley, Works Manager, and entertained at tea, Mr. Dieterichs acknowledging the firm's hospitality. On the following day an official visit was paid to the various Gas Exhibits in the Exhibition.

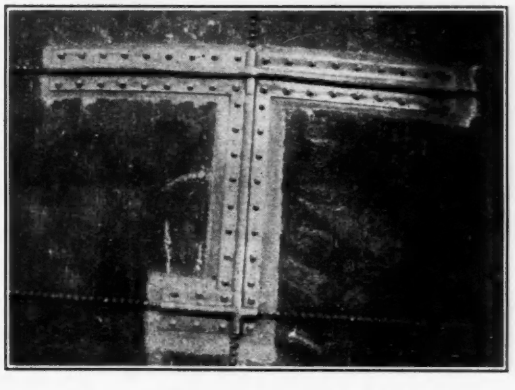
From the Profits of the Gas Department the Hamilton Town Council decided last week that a sum of £1,500 should be applied for the reduction of rates. The Gas Committee had recommended that the sum be £1,000. Speaking in favour of the figure being £1,000, Bailie Orr said that no part of the electricity surplus was devoted to this purpose and he did not see why gas consumers should be victimized. Profits from the Department should be used to reduce the charge to consumers. Ex-Bailie Kay, Convener of the Gas Committee, said that the Gas Department was handicapped by this sum being taken from its profits. They had recently decided to spend £18,000 on a new gasholder and if they had retained all their profits they would not have needed to borrow this money. Sir Henry Keith said the gas-works were by statutory enactment part of the Common Good, but the electricity works were not. The profits of the gas-works, except what was needed for gas-works purposes, belonged to the public. When their electricity department had sufficient funds to meet statutory needs, its profits would also help to reduce the rates.

The Principle of Freedom of Choice for tenants was recently vindicated by the Brecon Gas Company. At the last meeting of the Town Council permission to give a supply of gas for lighting purposes on a housing estate was refused the Gas Company, but at their monthly meeting last week a letter from the Secretary of the Company, intimating that the Council were not legally entitled to refuse the tenants of the houses this right, was read. The Council have now agreed to give the Company permission to deal with the new houses.

A Three-Term Evening Course in gas technology, demonstrating in practical cookery, and voice production, has been arranged at the Central Evening School of Domestic Economy, Whitworth Street, Manchester, 1, to meet the needs of women who already hold a diploma or certificate in domestic science or who are taking up training in preparation for such a qualification, and who wish further to qualify themselves for work as demonstrators with gas undertakings or for other posts connected with the Industry where such knowledge would be required. The instruction, which will be given on two evenings of the week, will be in the form of lectures and practical work. It will deal with gas and gas appliances of all kinds and cookery demonstrations both from the manufacturer's and the gas undertaking's view-point, and will include some training in the testing of gas appliances and dealing with faults. The training in voice production will be planned in relation to the students' needs as demonstrators. Visits to gas works and showrooms to inspect equipment, &c., will be arranged and will form part of the course. An examination in theoretical and practical work under the auspices of the Women's Gas Council will be held at the end of the course, and a certificate will be issued to successful candidates. The fee will be 25s. for the three terms.

An Interesting Holder Repair

We are indebted to Mr. W. G. Lucas, of the Long Buckby Gas-Works, for this photograph and the following particulars of an interesting repair to a gasholder while in commission. The large top plate is 4 ft. 6 in. long, the vertical one, 2 ft., and the small bottom one, 1 ft. All the bolts used are standard ⅜ in.



and all the holes except four, which are ⅞ in. diameter, are $\frac{7}{16}$ in. diameter. Mr. Lucas informs us that he can do 2 ft. run of plate with one ⅞ in. diameter hole, and that there was absolutely no risk at any time; he is quite satisfied that the repair will stand up to test.

North of England Association

Autumn Meeting at Sunderland

The Autumn Meeting of the North of England Gas Managers' Association, already announced for Oct. 7, will be held at the Palatine Hotel, Sunderland, under the Presidency of Mr. C. Dru Drury, M.Inst.C.E.

In the afternoon a visit will be paid to the works of the Washington Chemical Company.

Notes on High Pressure Gas Main Construction*

Reviewed by E. Crowther, M.Eng., M.Inst.Gas E.

This volume consists principally of a detailed record of the work done in 1929-30 in the laying of some seven miles of 10 in. main for the transmission of unpurified coke oven gas from the Altham coke ovens of the Lancashire Foundry Coke Company, to the Oswald Street Gas Works of the Burnley Corporation.

The author, who was Engineer-in-Charge of the construction, describes the route followed, with particulars of all features of interest and the means adopted to overcome numerous difficulties encountered. In this comparatively short length of main both cast iron pipe (socket and spigot, with lead wool joints, caulked by pneumatic tool) and steel pipe (long sleeve joints, acetylene welded) were employed, the latter type of pipe being laid in part overground, and in part below ground. Points of special interest include the intersection of an easement owned by the Manchester City Water Works, the passage of the pipe below the main line of a railway, the negotiating of several bridges, the crossing of the river Calne, and the trenching of sloping railway embankments. Each section of the work is fully and clearly described, and well illustrated by photographs, which, it is satisfactory to find, are placed each upon the same page as the text relating to them.

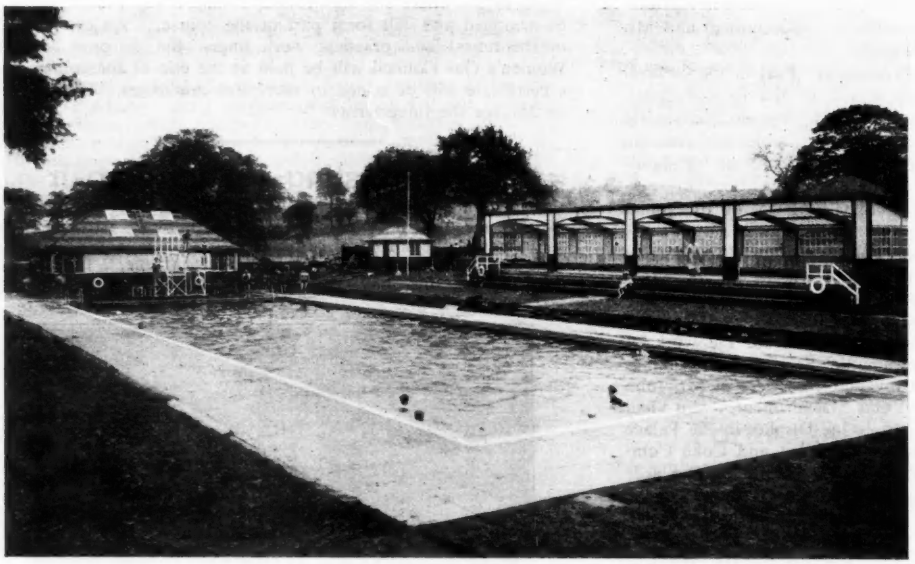
Following the description of the various sections, the author devotes several chapters to practical observations upon mainlaying and welding practice based upon the experience gained in the course of the work, all of which should prove very useful to an engineer called upon to undertake a large scale cross-country work.

After a short chapter on easements, &c., the text concludes with a discussion of the effects of expansion and contraction, and the methods adopted to control these—a matter which required special consideration where long stretches of pipe were laid above ground. The author stresses the merits of corrugated pipe, bends and loops for absorbing thermal movement, and describes their application for this purpose.

A short appendix is added setting out the costs of the whole work, and analyzing it into its various sections.

The volume is essentially of a practical nature, and keeps closely to its subject throughout, without the introduction of "padding." It makes no pretence of being a standard work of reference, but is calculated to be of considerable assistance to other distribution engineers who may themselves encounter some of the practical difficulties met and overcome in the course of the work described. With the introduction of the flexible joint for cast-iron mains on the one hand, and of improved protective sheathing and the spherical joint for steel mains on the other hand, main laying practice has been greatly facilitated since the date of the construction of the Altham main, but even so, if this main were being laid to-day, the engineering problems to be solved would remain the same, and experience such as is here recorded would be of the greatest value to the engineer called upon to solve them.

* By R. J. Restall, M.Inst.Gas E. Published by Walter King, Ltd., London; pp. 139, including appendix. Illustrated with photographs and folding plates. Price, 10s. 6d.

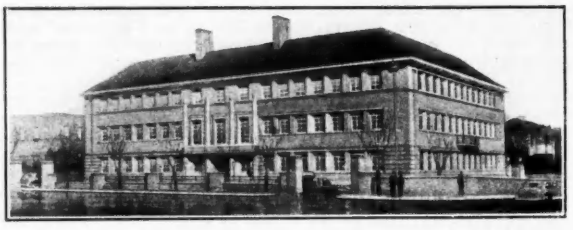


GAS-HEATED SWIMMING POOL

This new swimming bath, recently opened in Sheffield, has been equipped with a gas-heating installation by the Sheffield Gas Company

New Offices for Watford Company

The Watford and St. Albans Gas Company's new Chief Offices in Clarendon Road, Watford, which have become necessary owing to the Company's rapid growth and ever-increasing staff, were



opened on Sept. 12. The building, which has been christened "Radiant House," is situated at the corner of St. John's Road, and makes a worthy headquarters for so large and important a concern.

The moving-in was effected over the week-end, and the building will house the administrative staff of the Company, and includes the General Manager's, Chief Engineer's, Secretarial, Accountant's, and District Manager's departments.

Industrial Gas in Sydney

Craftsmanship and artistry are essential in the production of high-class medallion, enamel badges, and pressed art metal work. In the manufacture of medals and badges, commemorative plaques, and the like, annealing is a very important process. It renders the metals used workable in their various states and contributes to an elegant finish.

For the annealing of non-ferrous metal used, Amor, Pty., Ltd., of Sydney, which has been in this line of business for 50 years, has installed two additional gas-fired muffle furnaces, designed and installed with the co-operation of the Industrial Engineers of the Australian Gas Light Company. One is used entirely for annealing and the other for porcelain, opaque, and vitreous enamel.

Amor, Pty., Ltd., also use gas-fired furnaces to melt, smelt, and refine various precious metals, in defined proportions necessary to produce a specific article.

National Gas Council

Meeting of the Central Executive Board

A meeting of of the Central Executive Board of the National Gas Council was held at Gas Industry House, 1, Grosvenor Place, S.W. 1, on Sept. 13—Councillor G. H. Kitson (Vice-Chairman) in the Chair.

The late Dr. Charles Carpenter, C.B.E.—The Chairman referred with deep regret to the loss the Gas Industry had sustained in the death of Dr. Charles Carpenter, who had been a distinguished figure in the Gas Industry for so many years. A floral tribute had been sent on behalf of the President of the Council and members of the Central Executive Board, and a letter of sympathy had been addressed to Mr. Frank Jones (the President) and the Directors of the South Metropolitan Gas Company. The Secretary had also represented the Board at the funeral at Nunhead Cemetery the previous day. Members were reminded that there would be a Memorial Service at Southwark Cathedral on Saturday, Sept. 17, at 3 p.m. The members of the Board stood in silence as a token of respect.

Air Raid Precautions.—The steps which were being taken by the Gas Industry in connexion with this matter were discussed.

Mains and Cables in Highways.

(*a*) *West Yorkshire Gas Distribution Bill.*—Satisfaction was expressed with the nature of the protective clause in favour of the Highway Authorities which had been inserted in the West Yorkshire Gas Distribution Bill (promoted by the United Kingdom Gas Corporation, Ltd.).

(*b*) *Proposed Appointment of Joint Committee of Both Houses of Parliament.*—It was reported that it had been announced in the House of Commons that a movement had been made for the appointment of a Joint Committee of both Houses to consider the question of mains and cables in highways, but that the precise terms of reference had yet to be settled. The Joint Committee had not yet been appointed, so no steps could be taken in the matter at this juncture. It was obvious, however, that the Conjoint Conference of Public Utility Associations would have to tender evidence before the Committee.

Rating and Valuation.

(*a*) *Re-valuation of Public Utility Undertakings in the County of Kent.*—With regard to the proposals which have been made to re-value Public Utility Undertakings throughout the County of Kent, it was announced that the County Valuation Committee had given an undertaking that no further steps would be taken in pursuance of the proposals until the end of October.

(*b*) *Provisional Re-valuation of Public Utility Undertakings throughout the Country.*—Reference was made to the circular letter issued to rating authorities earlier in the year by the Minister of Health, following the extension of the present quinquennial period until April, 1941, in which it was suggested that provisional lists should be prepared "by proceeding with the preparations for re-valuation which have already been commenced by many Local Authorities," notwithstanding that the present quinquennial period has been extended.

It was not clear from this circular whether it was intended that these provisional lists should come into operation immediately or whether they were lists compiled solely for the information of the Minister, and not intended to come into operation. It had already been reported to the Board that the Conjoint Conference had requested the Central Valuation Committee to express their views on the matter, but up to the present no reply had been received. It was clear that no uniform practice existed among rating authorities. In certain cases undertakers had been asked to supply information, coupled with an intimation that it would only be used for the provisional lists suggested by the Ministry. In other cases, however, rating authorities were seeking to carry out forthwith a wholesale re-assessment of undertakings throughout their area.

The Conjoint Conference, having regard to the widespread uncertainty as to the nature of the circular, proposed to communicate once again with the Central Valuation Committee and also with the Ministry of Health on the subject. The Council proposed to advise Undertakers by circular letter as to what steps they should take in the matter.

(*c*) *Departmental Committee on Valuation for Rates.*—Members were reminded that in July last the Minister of Health had announced that he had appointed a Committee "To consider allegations which have been made that a strict application to certain classes of property of the existing law of valuation for rating purposes would cause undue hardship, and, if these allegations are found to be justified, to report what amendment of the law is desirable." The Chairman of the Committee was Mr. Maurice FitzGerald, K.C.

The Conjoint Conference of Public Utility Associations had at once written to enquire whether the term "certain classes of property" contained in the terms of reference would include property belonging to Public Utility Undertakers. The reply was that, while the terms of reference were rather wide, the Committee themselves contemplated that their enquiries should be mainly directed to the question of the valuation of dwelling-houses. They would, however, be prepared to consider any representations which it might be desired to submit to them in writing.

This question, it was stated, would be considered by the Rating Committee of the Conjoint Conference on Sept. 22.

World Power Conference, Vienna Sectional Meeting, 1938.—It was reported that 92 people from the United Kingdom had participated in the visit to Vienna which commenced on Aug. 25. The National Gas Council had been represented by Councillor G. H. Kitson (Vice-Chairman of the Board), Mr. H. E. Bloor, Major F. J. Bywater, Mr. H. G. Ritchie, and Dr. C. M. Walter. The Chairman gave a brief report of the proceedings.

Another Prize-Winning Carnival Display

This display by the Ilfracombe Gas Company in the local Hospital Carnival was successful in gaining second prize in its class. On the same occasion, employees of the Company dressed as Mr. Therm, were responsible for collecting over £10 for the Hospital Funds.

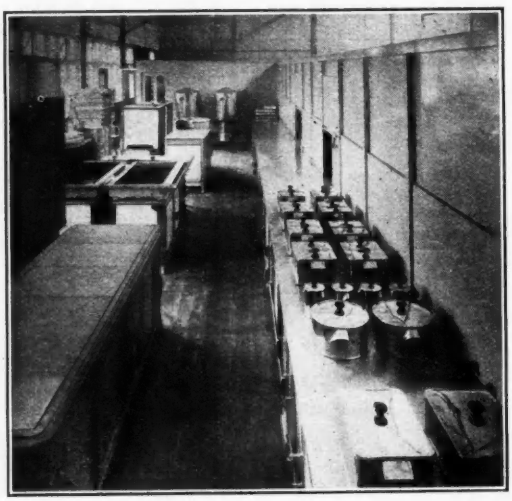
Two New Large-Scale Cooking Installations

The above photographs show two recently completed large-scale gas cooking installations supplied by Radiation firms. On the left is the kitchen of the Zetland Hotel, Saltburn-by-the-Sea, and on the right the canteen at the Wallshaw Depot of the Oldham Corporation Passenger Transport Department. In the hotel kitchen are four "Grosvenor" ranges, hot-closets, carving tables, bain marie, stockpot stand, and steamer by Fletcher, Russell, and Co. The Oldham installation, which was by the Richmonds Gas Stove Company, comprises a "Chester" double range (ovens only), boiling table, steamer, hotclosets, fish-fryer, "Equator" boiler, and ventilating hood. This installation provides dinners at 8d. per head for 300 employees on the maintenance staff.

Gas Equipment for Works Canteen

Interesting Installation at Coventry

Our photograph shows the canteen at the Coventry Gauge and Tool Company, Ltd., which has recently been equipped by the Coventry Gas Department with a full range of up-to-date gas appliances for dealing with 250 to 300 dinners daily. The kitchen counter is 40 ft. 6 in. long with stainless steel top, made up in 13 ft. 6 in. sections, one cold and two gas-heated, the latter being fitted with copper water chamber under top and having an arrangement of vegetable boxes, soup and gravy tureens, and containers for sweets, &c. The whole counter is fronted by a wood screen with "Atlasite" board on the front, and fitted with sliding hatchways.



Other equipment in the Coventry Gauge and Tool Company's canteen is as follows:

Two vegetable and pudding steamers.
One 20-gallon boiler.
One L.55 "Electrolux" refrigerator.
One 2-pan fish fryer.
One 8-ft. hot closet with plain top.
One griller and toaster on stand.
Two double-oven cooking ranges.
One 4-ft. hotcloset with carving recesses.
One 4-ft. hotcloset with plain top.
One Ascot NEA 38 instantaneous water heater.
Two Jackson's T5 size "Teatomatons" (each 25 gallons capacity for tea making).
One dishwashing machine, three compartment size, with electrically operated tank agitators and gas heated. Pre-heated water supplied to each tank by the Ascot NEA.38 instantaneous water heater. This machine is capable of dealing with over 2,000 pieces of crockery per hour.

The whole of the equipment is in special finish and represents one of the most modern installations in Coventry. We understand that the firm are exceptionally pleased with the lay-out.

Amalgamation and Grouping

Torquay and Totnes.

The absorption of the Totnes and Bridgetown Gas Light and Coke Company by the Torquay and Paignton Gas Company has now been completed and the former undertaking now no longer exists on a separate entity.

Gas-Heated Greenhouse on Wheels

The Mablethorpe and Sutton Gas Company were awarded first prize for a very ingenious exhibit which they entered in the recent local carnival.

This comprised a greenhouse, "glazed" with cellophane and mounted on a lorry. The display was constructed by the staff of the Company and was, of course, equipped with a special gas-heating installation for such applications. The display was complete with plants, while a nurseryman was depicted doing some appropriate potting at the back of the lorry.

Wales and Monmouthshire Association of Gas Engineers and Managers

Autumn Meeting at Porthcawl

Favoured by weather conditions which enhanced the well-known natural attractions of Porthcawl, the Wales and Monmouthshire Association of Gas Engineers and Managers once again assembled there for their autumn meeting, on Wednesday and Thursday, Sept. 14 and 15. They are fortunate in that Porthcawl so admirably fulfils the requirements of a meeting place, because there is something about it which is conducive to that feeling of helpfulness and good comradeship which is the very mainspring of the Association. The meeting place was again the Grand Pavilion, only a few steps from the Esplanade Hotel, which the members make their headquarters.

Mr. J. STEPHENSON, of Aberdare, the President, was in the chair, and, in opening the proceedings, announced the receipt of an apology for absence from Mr. R. Robertson, of Bristol (President of The Institution of Gas Engineers), and one of the members of the Association. The President said they were very proud that another of their members had been elected to the highest office in the Industry, and deeply regretted that Mr. Robertson could not be with them at that meeting. He was the third of their members within the short period of eleven years to be elected President of The Institution of Gas Engineers. Col. Planck, also one of their members, who was Chairman of the Society of British Gas Industries, was unfortunately unable to be with them. Then they greatly missed their dear old friend Mr. Octavius Thomas, who still took the keenest interest in the affairs of the Association, and who was with them in spirit, though his doctor did not think it wise that he should make the journey to Porthcawl. A short time ago he (the President) was with Mr. Octavius Thomas, and found him full of the business of the Association.

Upon the suggestion of the President, the members cordially agreed that a telegram of greetings in the following terms should be sent from the meeting to Mr. Octavius Thomas:

> "Your members in general meeting in Porthcawl send you greetings, warmest remembrances, and best wishes. Stephenson, President."

Death of Dr. Carpenter.

Mr. H. D. MADDEN (Cardiff), called upon by the President, made reference in feeling and appreciative words to the death and career of Dr. Charles Carpenter, one of the eminent leaders of the Gas Industry. He said that, as one who had known Dr. Carpenter well, he realized that the Industry had lost a very great leader—a man who had lived for the Industry. He did not believe that Dr. Carpenter had ever had one selfish motive in his heart. Those who wanted help he was always ready to assist. Indeed, he did everything which he thought would promote the welfare of the Industry. As an instance of this, Mr. Madden pointed to the fact that the Cardiff Gas Light Company were the first to take up the basic price principle after the South Metropolitan Company, and Dr. Carpenter was three days in attendance at the enquiry, ready to give any assistance that might be required. His scientific work was of a very high order, and the results of his researches were placed freely at the disposal of the Gas Industry. When the question of petitioning for a Royal Charter for the Institution was under consideration during his (Mr. Madden's) Presidency, he would never forget seeing Dr. Carpenter come along to the meeting, and take a back seat. He declined to come to the front of the hall, but he supported the proposal strongly, and the fact that he had got up from a sick-bed to be present at the meeting showed how much he had the welfare of the Industry at heart. He (Mr. Madden) was sure that it would be the wish of all those present that their deep sympathy with her in her bereavement should be conveyed to Mrs. Carpenter.

The members signified approval of this by rising silently in their places.

Additions to Membership.

Mr. WILFRED JONES (Cardiff), who had long assisted Mr. Octavius Thomas in his work for the Association, undertook the duties of Hon. Secretary in his absence, and read the minutes of the last meeting, which were confirmed. He then announced the following additions to the membership of the Association, which were agreed to, on the proposition of Mr. H. MATTERFACE (Monmouth), seconded by Mr. F. J. EDMONDS (Waterford).

Ordinary Members.

A. L. Thomas, Assistant Engineer, Neath Corporation Gas Department.

F. D. Thomas, Assistant Engineer, Merthyr Gas Company.

C. C. Evans, Assistant Engineer, Garw and Ogmore Gas Company.

Frank Fielden, Manager, Gowerton Gas Company.

Associates.

Edward Hurst.

John W. Elliott.

S. G. Watson, M.Sc.

Charles Perry.

The PRESIDENT remarked that it was a great pleasure to realize that the membership roll was continuing to grow. It was the hope of all that these new members and associates would be of help to the Association, and that the Association would be of use to them.

The Presidency.

The receipt was announced of a letter from Mr. B. Taylor, of Treharris, the President-Elect, stating that owing to reasons of health he would be unable to take up the position of President, and he must therefore ask the Association to choose someone in his place.

Mr. MADDEN said that he had consulted Mr. Octavius Thomas on the subject. If they would leave it to the Council to nominate someone, and in the meantime ask Mr. Stephenson to carry on for a little longer, this would give the Council a chance of meeting and making a proposition to the members in the matter.

The point was raised as to whether it would be necessary to call the members together, or whether they could delegate to the Council the duty of appointing a President for the ensuing year.

Mr. W. CLARK JACKSON (Neath) questioned whether the by-laws would permit of the latter course being taken, and said that, while no doubt the members would heartily support the Council in their recommendation, he thought, if it was not convenient to call a meeting, a circular-letter might be sent out asking for a plain answer, "Yes" or "No."

The PRESIDENT said if it was the considered wish of the meeting that this should be done, no doubt it would be.

On the proposition of the PRESIDENT, seconded by Mr. R. J. AUCKLAND (Cardiff), it was agreed:

> "That the members of this Association in general meeting express their deep sympathy with Mr. B. Taylor in his indisposition, and regret that on account of same he is unable to take up his position as President. They sincerely trust he will soon be restored to full health and strength."

Mr. MADDEN, as Immediate Past-President, then, in the absence of Mr. Taylor, asked Mr. Stephenson's acceptance of a silver salver, suitably inscribed, as a token of their esteem and as a memento of his year of office. He declared that Mr. Stephenson had lived well up to the reputation of Presidents of their Association.

The PRESIDENT, in acknowledging the gift, remarked that to him it had been a great sorrow that Mr. Octavius Thomas had not been able to attend the meetings during his year of office. He had to thank him for very many things; his kindly help had always been available.

Presentation of Prizes to the Juniors.

At this point, the PRESIDENT asked Mr. Ross Taylor, M.P., to present to the Juniors the prizes for work done for the Wales and Monmouthshire Junior Gas Association and for having passed examinations.

Mr. ROSS TAYLOR said it was a great pleasure to him to be selected once again as the representative of the National Gas Council at the meeting of the Association, and he was deeply gratified at being asked to distribute the prizes. He would like, in the first place, to endorse what had been said with regard to the regretted absence of Mr. Octavius Thomas. He had been many times to their meetings at Porthcawl, and had formed the highest opinion of Mr. Octavius Thomas, who on every occasion had done all that he possibly could for the comfort and enjoyment of everyone attending. Those to whom prizes were being awarded belonged to an Industry which was young and vigorous, which renewed its youth year by year. They might count themselves lucky that they had joined such an Industry, and might look forward to a useful career. The Gas Industry in South Wales had kept its head above water at a time when there had been many difficulties to face. South Wales had been more successful, he thought, than any other part of the country in meeting difficulties created by the Coal Mines Act. He would say to all of those who were just beginning their career in the Industry: "Stick to it, and remember you are in an Industry which is of the very greatest importance to the country as a whole." He then distributed the prizes.

The PRESIDENT, thanking Mr. Ross Taylor for having distributed the prizes, said they were always delighted to have him with them.

Special Purposes Section.

The 28th annual report of the Special Purposes Section was then presented. This stated that six meetings had been held during the year. The membership consists of ten local authorities and 26 companies. Collaboration in regard to coke prices continued throughout the year. The Committee staged a comprehensive Joint Gas Exhibit at the Industries Fair held at Cardiff last April, under the auspices of the National Industrial Development Council of Wales and Monmouthshire, which resulted in considerable publicity to the Industry.

The Co-operative Tar Scheme has continued to function satisfactorily throughout the year, but in this respect a still greater improvement could be effected if more undertakings co-operated. Those undertakings who are not members are urged to consider the advisability of joining.

The receipts for the year amounted to £49 13s. 7d., and the payments to £49 8s. 11d. With the balance brought forward, this leaves the sum of £76 15s. 2d. in the hands of the Treasurer, together with £300 of 2½% Consols.

The report and accounts of the Section were adopted, on the proposition of Mr. J. F. Rust (Newport), seconded by Mr. A. E. Pask (Caldicot).

The Paper.

The President announced that a Paper had been prepared by Mr. A. D. Howells, of Abergavenny, entitled "The Development of a Small Undertaking." Unfortunately, however, the Author had met with a slight accident on the previous day, and had had to return home. At very short notice, therefore, they had prevailed upon Mr. F. Stuart Johns to read the Paper. Mr. Johns had been recently appointed President of the Junior Association, and it must be particularly gratifying to his father that the name of Johns, which had been associated with the Gas Industry for so many years in that district, was going to be carried on by the son, and they hoped with as great success.

The Paper, and our report of the discussion which followed, will be dealt with in a subsequent issue.

As has become customary, it was decided that the place of next meeting should be left to the Council to determine.

Luncheon.

At the close of the business, members and guests to the number of well over a hundred sat down to luncheon in the Esplanade Hotel, after which the two Cups and replicas which had been won on the golf course during the previous day were presented—the Upjohn Cup to Mr. R. J. Auckland, and the Dean Cup to Mr. H. Butterworth.

The toast of "Prosperity to Porthcawl" was submitted by Mr. W. Clark Jackson, who said the town was one for which the members of the Association had a deep regard. The Urban District Council had modernized its Gas Department, which was now able to give a better service than formerly. The present condition of the undertaking reflected credit on the Council, the Gas Committee and the Manager, Mr. S. Walker. Responding, Councillor Edward Thomas, Chairman of the Porthcawl Gas Committee, spoke of the essential services which gas could render, and went on to declare that it was their intention as a Council to make Porthcawl one of the best holiday centres along the coast.

The next toast—that of "The Association"—was in the hands of Mr. R. G. Shadbolt, who pointed to the one-third of a century of useful service which had been rendered. The Association, he said, would always be inseparably linked with the name of Mr. Octavius Thomas, a man with whom it had been his great good fortune to be associated for an even longer period than one-third of a century; a man who had put his whole heart and soul into the furthering of the interests of that Association. They were sorry Mr. Octavius Thomas was not with them that day, but he was very much in their minds, and would remain so for as long as the Association might exist. During its lifetime the Association had contributed largely to the advancement of the Industry, and at the same time it had not overlooked the social side and the human element. Not the least important part of the work done was in connexion with the Junior Association, which Mr. Octavius Thomas had long tended with the care of a father. In conclusion, Mr. Shadbolt recalled the origin of the Junior Association movement in Manchester—a movement which, he said, had become, in numbers, in vim, and in enthusiasm, a vital part of the Gas Industry.

The PRESIDENT, responding, said they were very proud that the toast should have been proposed by a Past-President of The Institution of Gas Engineers. He himself was a foundation member of the Yorkshire Junior Association at somewhere about the same period as had been referred to by Mr. Shadbolt. The Junior Association in Wales was of later date, but it received more support from the Senior Association than did the other Junior Associations in the way of awarding prizes and in other directions. He was sure that this support would continue, and he hoped that other Senior Associations would follow suit, because it was of the utmost importance that students should be encouraged by every possible means.

Golf Competitions.

The customary golf competitions took place on the day preceding the meeting, once again on the admirable links of the Royal Porthcawl Golf Club, where a delightful time was spent. The arrangements worked out with the utmost smoothness, organized as they had been by Mr. Joe Sadler in his usual efficient manner; and it is pleasing to record that during the social gathering later in the day tangible expression was given to the feeling of gratitude to Mr. Sadler which members of the Association and friends entertain on account of his many times repeated services in this connexion. It is interesting to note that the competitions both morning

and afternoon resulted in ties, so that the winners had to be decided on the last nine holes.

Upjohn Cup.

The morning competition for this Cup was by medal play, and the scores were as follows. Mr. R. J. Auckland won on the last nine holes.

R. J. Auckland	.. .. ..	87 — 9	= 78
S. C. Whitfield	.. .. ..	94 — 16	= 78
H. Butterworth	.. .. ..	93 — 14	= 79
R. R. Bird	.. .. ..	87 — 7	= 80
F. Boardman	.. .. ..	95 — 14	= 81
W. C. Jackson	.. .. ..	85 — 2	= 83
E. Hurst	.. .. ..	99 — 15	= 84
D. W. Rees	.. .. ..	89 — 4	= 85

Wilfred Dean Cup.

In the afternoon there were bogey singles, with scores as follows. Mr. Butterworth won on the last nine holes.

H. Butterworth	.. .. 2 down
T. B. Walker	.. .. 2 ,,
F. Boardman	.. .. 5 ,,
R. J. Auckland	.. .. 6 ,,

In the evening a company of about fifty sat down to dinner in the Esplanade Hotel, under the genial chairmanship of Mr. R. J. Auckland, who remarked that they had with them the Captain of the Royal Porthcawl Golf Club, Mr. E. E. Davies, O.B.E., who was a thorough good sportsman. They were also pleased to welcome again the Club's professional, Mr. Hutchinson, who was a dear old friend of theirs. It was a matter of sincere regret that the Secretary, Mr. Hubert Redford, had another engagement, which prevented him from being with them. All who had taken part in the day's proceedings were deeply grateful to the Club for having permitted them again this year the use of their magnificent links.

Mr. C. R. Averill having presented the prizes, other than the Cups, which were reserved until the following day, the Chairman proceeded to announce another pleasing little function. He said they had all been thinking for some time past that the outstanding services of their old friend Mr. Joe Sadler were well overdue for tangible recognition, and they had decided upon a presentation, to take the form of a gold watch. The presentation was made by Mr. E. S. Allen, who said that the many happy days which the Golfing Circle of the Association had spent had been made possible only by the great efforts that the organizer, Mr. Joe Sadler, had put forth on their behalf. Nobody could have done more to ensure success for the Golfing Circle. Returning thanks, Mr. Sadler said that anything he had done had been a labour of love, and he hoped he might be spared for many years to carry on

Two Million Cu.Ft. Gasholder Inaugurated at Bedford

"No. 5"—a 2 million cu.ft. gasholder and the latest addition to the storage capacity at the Works of the Bedford District Gas Company was put into commission last Thursday when Sir Thomas Keens, D.L., F.S.A.A., Chairman of the Bedfordshire County Council, opened a valve releasing gas to the town mains and breaking a bottle of champagne against the tank. The ceremony, marking yet another great step forward in the progress of the Bedford Company, was witnessed by a large gathering, representative of the social and public life of Bedford and district, and including gas engineers and managers from neighbouring undertakings.

The holder, which is of the spirally-guided type, was erected by Messrs. C. & W. Walker, Ltd.

The ceremony over, the company adjourned to the Co-Partners' Hall, where a most enjoyable lunch awaited them. The Chair was taken by Colonel W. M. Carr, T.D., O.B.E., Chairman of the Bedford Company and Managing Director of the United Kingdom Gas Corporation, Ltd.

Sir THOMAS KEENS voiced his appreciation at being present at the inauguration of the holder, a ceremony which to him was something of a novelty, but which was also clear evidence of the vitality and expansion of this 105-year-old concern. He could not help thinking that the progress of the Company, in spite of its great rival, electricity, was due to one fact alone; that fact was its efficiency and efficient service to the consumer, and he suggested that at both Luton and Bedford the consumer had enormous advantages. In both those towns the gas supply was in the hands of a private company and the electricity undertaking was controlled by the municipal authority, and there was real competition between the two commodities. There was a school of thought that advocated the public ownership of all public utilities, but he contended that the deciding factor should be the efficiency of an undertaking. He thought the progress of the Industry was remarkable, but it was amusing to recall the days when the spur of competition was lacking and progress was slow. The directorships were then excellent offices for gentlemen of declining years, of whom little was expected and to whom the emoluments received were highly satisfactory. But the house had now been set in order and in spite of competition progress had been steady, continuous, and, in his view, entirely remarkable. The scales had been weighted against gas in favour of electricity, and in view of that fact all the more praise was due to the Gas Industry. They had received a letter from Mr. Phillips, Engineer at Luton, regretting his inability to attend the ceremony and intimating that his son, Mr. G. Phillips, would represent him. Mr. G. Phillips was the fourth generation of a family who have served the Gas Industry in South Bedfordshire for upwards of ninety-four years. He had great pleasure in proposing "The Bedford District Gas Company," coupled with the name of Colonel Carr.

In the course of his reply, Colonel CARR observed that the Bedford Company, under the direction of Mr. Hansford, was one of the most progressive in the country. Its progress during the past ten years had been remarkable, and he was sure it would be continued. The co-operation of the United Kingdom Gas Corporation could bring help to Mr. Hansford in many ways, and Mr. Hansford in turn could help some of the smaller undertakings in Bedfordshire in the interest of the Gas Industry of the country. The Bedford Company had a great reputation for service and they, the new Directors, were determined that tradition should be maintained. Some of them had the advantage of a long association with the Gas Industry and they had to prove by the service they gave and their efficiency that the grouping of gas undertakings was justified. They had many difficulties to face at the present time, and one of these was the greatly increased cost of coal. They did not object so long as they knew all other users were required to pay the same price, but there was a great temptation for coal owners to exploit what they called competitors; public utilities must not be exploited. He believed that in time the Coal Selling Schemes would be brought into line and the Government would take steps to prevent exploitation which he knew was going on in some quarters. In conclusion, on behalf of the Bedford Company and Messrs. C. & W. Walker, Colonel Carr had great pleasure in presenting a silver rose bowl to Sir THOMAS, who expressed his thanks in cordial terms.

Some interesting details of the construction of the new holder were given by Mr. J. B. HANSFORD, Managing Director of the Bedford Company, in proposing "The Contractors." Mr. Milbourne they all knew as an expert on the construction of gasholders, and he thought the work reflected the greatest credit on everybody concerned. The work was started on Dec. 6, 1937, and concluded on Aug. 12. The diameter of the holder was 162 ft. and its height 155 ft. Steel to the weight of 1,031 tons had been used in its erection, and the sheeting had been covered with over four tons of paint. Replying, Mr. R. J. MILBOURNE, J.P., A.M.I.C.E., Chairman and Managing Director, Messrs. C. & W. Walker, Ltd., said it was twelve years since his firm had the privilege of erecting the last gasholder at Bedford and he was grateful again to be associated with the Company in the construction of "No. 5." The contract had been carried out under the most pleasant conditions for Mr. Hansford and his staff, while insisting on a very high standard of workmanship, had given them every possible aid. He commented most favourable upon the excellent curbing carried out by Mr. Hansford's staff, who, he suggested, might therefore be very well associated with the toast.

"The Visitors" was in the able hands of Captain BRUCE H. OTTLEY, Director of the Bedford Company and Chairman of the United Kingdom Gas Corporation, who recalled a treasured friendship with the Rev. Paul Wyatt, late Chairman of the Bedford Company, long before he himself dreamt of being a Director of the Company. Among the many visitors he mentioned was Mr. W. C. Chapman (Boston), President of the Eastern Counties Gas Engineers' and Managers' Association. The reply was by the MAYOR OF BEDFORD, Alderman W. E. Sowter, M.B.E., J.P.

EXPERIENCES AND IMPRESSIONS OF

Thirty Years in the Gas Industry

by

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A Paper read before the North British Association of Gas Managers at their Annual Meeting at Largs on Sept. 8.

Thirty years ago, when the writer may be said to have entered that stage of his career when education and training give way to practical experience, continuous carbonization in vertical retorts had reached practical realization. The late Mr. Bezant, writing at about that period, said, "Ever and anon the imagination of the workers in this particular field had been fired by a desire to enhance economical and productive result by departing from the intermittency of carbonizing practice and effecting the carbonization of coal by a continuous process. It has been the dream of many workers." At length, he wrote, the dream of continuous carbonization had been realized, and it is at this point my story begins.

The vertical retort in itself was no new thing. To go no further back, Brunton in 1828 patented a vertical retort which, had it been built on a practical scale at all, would then have been made of cast iron and worked at very low temperatures. Evans in 1861 described an intermittently charged vertical retort which, he said, would be made either of fireclay or of cast iron. Dieterich patented in 1880 a retort which is, perhaps, the first of the practical proposals for intermittent carbonization in vertical retorts and which culminated in the Bueb or "Dessau" patent of 1904. From this date continuous carbonization in vertical retorts began to develop along several parallel lines, of which two came to fruition about 30 years ago, the Woodall-Duckham and the Glover-West Systems. The latter, with which I am better acquainted, grew out of the continuous vertical retorts used for the distillation of shale, patented, in the first place, by William Young and George Beilby in 1881 and adapted to the carbonization of coal by William Young and Samuel Glover in their patent of 1905.

It is curious that in this patent the emphasis is mainly laid upon the method of heating the retort "wherein the temperature is so controlled that the volatile matters shall be distilled or evolved out of the coal as rapidly as possible at gradually increasing or progressively higher temperatures, &c." Opinions may differ about the value of the "radiant heat" for which so much was claimed at that time, but it is certain that the inventors provided for a retort in which the temperature could be graded throughout its vertical length according to requirements, a feature which is characteristic of the system to which this and subsequent patents gave birth.

The plant which was eventually built at St. Helens was that described in the patent of Samuel Glover and John West of 1907 which claimed "a regenerator setting for vertical retorts divided by horizontal partitions into a number of separate and distinct chambers, the arrangement whereby the lower chambers around the lower ends of the retorts impart the heat from the hot residual coke in the retorts to the secondary air required for complete combustion in the other chambers," and "the construction of a setting of vertical retorts having a number of separate and independent combustion chambers each of which is separately controlled by means of dampers or slides whereby the temperature may be increased or decreased in each separate chamber and the distribution of the heat throughout the length of the retort regulated at will," together with a similar arrangement at the top of the setting whereby the heat of the products of combustion is imparted to the incoming coal before they leave the setting. In all essentials the principles of construction foreshadowed in that patent specification have remained those of this particular system of continuous carbonization in vertical retorts.

The coke discharger, another vital point in the design of continuous vertical retorts, was subsequently changed to the helical or worm discharger, which was described in patents of 1909 and 1910, also standing in the names of Messrs. John West and Samuel Glover.

The installation at St. Helens was erected under a contract by the terms of which its acceptance was subject to satisfactory tests by an independent authority, a position which was ably filled by Mr. A. E. Broadberry, of Tottenham. But before the plant was submitted to his judgment it was examined by two other independent persons of whom the writer was privileged to be one, acting with the approval of the Southport Corporation Gas Department and the late Mr. John Bond, under whom he was then serving as Chief Chemist. The other was Dr. H. G. Colman, the well-known consultant on carbonization and allied subjects.

It was this work which brought the writer into contact with those virile intellects whose influence and whose example made this the turning point of his career.

The results obtained in that plant (in March, 1909) make interesting reading to-day. The writer's own test on washed Orrell nuts from the Lancashire coalfield show that approximately 70 therms per ton were made at a gross calorific value of 600 B.Th.U. per cu.ft.

Dr. Colman conducted tests with several varieties of coal, and the results may be summarized as follows:

Coal.	Calorific Value B.Th.U./Cu.Ft., Gross.	Cu.Ft./Ton.	Therms/Ton.
Durham, Thornley ..	573·6	13,102	75·2
Yorks. Silkestone	584·9	12·435	72·7
Lancs. Wigan Arley ..	576·2	12,145	70·0

The points to note are the high calorific value of the gas made and the thermal yields, which are in line with the best modern practice.

Among the early published results, those obtained at Droylsden and given by Mr. J. G. Newbigging in his Paper read before the Institution at Glasgow in 1911 show that a considerable degree of flexibility was possible even before the introduction of steaming—a higher make per ton was obtained at the lower calorific value with a higher thermal yield.

	High Calorific Value.			Low Calorific Value.		
	Cu.Ft./ Ton.	C.V.	Therms/ Ton.	Cu.Ft./ Ton.	C.V.	Therms/ Ton.
Lancs. coal ..	11,868	587	69·7	13,033	552	71·9
Yorks. coal ..	12,059	579	69·8	14,236	548	78·0
Derbyshire coal ..	11,584	582	67·5	14,258	544	77·6

But though there was, thus, considerable flexibility in the original system, it was steaming, which first saw the light in response to the demand for increased makes per ton in an emergency, which revealed the great possibilities of the continuous vertical retort in this respect.

This flexibility is of two kinds. The retort may be kept at its maximum capacity and yield a gas of any calorific value over a wide range or the calorific value may be kept constant and the production of gas may be varied over a range depending on the class of coal under treatment.

It has been interesting to note the effect of progress in the development of the continuous vertical retort on other and competing systems. It may be observed that, generally, in any industry, advance along any one line is accompanied by corresponding advance along other lines.

Two instances may be given of this. The first is that of the Gas Industry itself. The competition of electricity has

served merely to stimulate progress in the Gas Industry. But a closer analogy within a single industry is that of methods of boiler firing. The introduction of pulverised coal, with its almost molecular contact with the air for combustion, threatened at one time to eliminate the mechanical stoker altogether. But what was the result? It was merely to stimulate the designers of mechanical stokers to such an extent that to-day the latest and most efficient steam boilers are being fired by some form of mechanical stoker.

In the same way continuous carbonization in vertical retorts has stimulated designers of intermittent carbonizing plant to such an extent that, while the continuous vertical retort still produces the cheapest therm in an appropriate market, the general thermal efficiency of carbonizing plant of most types has reached a point which was quite unexpected until the continuous plant showed the way. Dr. Parker has shown that the thermal efficiency of a continuous vertical retort plant with a modern waste-heat boiler is 88%, and it is claimed that the present-day carburetted water-gas plant, similarly equipped, reaches a thermal efficiency of 80%.

Before leaving the subject of developments in the economy and design of continuous vertical retorts, reference must be made to the saving in ground space which has been effected since the first installations were erected. This feature of the continuous vertical retort is sometimes one of considerable importance. It has on occasions been instrumental in solving the problem of providing for increase of gas-making capacity without incurring the very high expense of moving works to a new site, or of making expensive purchases of land adjoining the existing site. The original plant at Macclesfield, for instance, had a capacity of 2·1 therms per day per square foot of space occupied. When the same plant was reconstructed and modernized the capacity was raised to 2·8 therms per square foot, but when the new installation was erected in 1934 this figure was again raised to 3·1.

At Carlisle the original plant of 1922 had a daily capacity of 2·5 therms per square foot of ground area occupied, but in the extension installed last year this figure was raised to 3·1, while in another instance the original installation of 1912 had a daily capacity of 1·9 therms per square foot, and this figure was raised to 2·6 in the extension installed in 1922 and to 3·75 in the most recent extension, that of 1936.

The development of the continuous vertical retort was no doubt mainly accelerated by the abrogation of the candle power standard when the national emergency of 1914-1918 demanded that the greatest possible economy must be exercised in the utilization of coal. But this abrogation had been prepared for by developments in the use of gas itself.

The candle-power standard became an absurdity when the use of gas for purposes for which the heating value was the only criterion had increased to the majority point, and particularly when in lighting itself the incandescent burner had rendered candle-power a property of no practical significance whatever.

Even before the dates I have mentioned, the great London companies had secured the substitution of a calorific standard for that of candle-power, and by 1915 a minimum of 500 B.Th.U. gross per cu.ft. was very generally adopted, a figure which was approximately equal to the calorific value of a gas which developed 14 candle-power in the No. 2 Metropolitan Argand burner. But when the authorities were obliged to request gas undertakings to recover benzole and toluole in every possible way from the gas and tar, the maintenance of the 500 B.Th.U. standard became impossible and official testing was abolished. Gas undertakings were free to investigate the question of the best and most economical calorific value in their own individual circumstances, and by the time that the Department of Scientific and Industrial Research was ready to cope with the question in 1917 a considerable body of information was available.

The net result was the introduction of the therm, and it is interesting to look back at the publications of the Fuel Research Board, particularly that of January, 1919, which formed the basis ultimately of the Gas Regulation Act of 1920.

"We believe," said the Board, "that the interests of the consumers can best be served when their contract with the gas undertaking is based on the sale and purchase of heat energy measured in fixed units which can be scientifically determined by simple means. We propose, therefore, that the consumer should be charged for the thermal units which he actually receives in the same way as the consumer of electricity is charged for the Board of Trade units which pass through his meter."

Incidentally, the Board (it was no part of their duty) did not point out that the new therm, which was to be sold at something like 10d., was the equivalent in heat energy units of more than 29 Board of Trade units of electricity which are still not generally sold at less than a penny each.

But the Board did make an observation which is as true to-day as it was then. "The sheet anchor of the Gas Industry in the future must necessarily be its possession of the cheapest known means of distributing potential heat energy in a convenient form. For lighting and for power production the electric supply of the future may seriously contest the field with the producers of gas, but for the supply of heat, gaseous fuel ought to remain supreme if its production and use are developed on sound lines."

The Report to which I am referring was that in which the principle of the declared value was recommended for adoption. But some of their recommendations were not adopted. It was possibly pure wisdom which led legislators to ignore the suggestion that the percentage of inert constituents in town gas should be limited, but it is questionable whether gas undertakings themselves were wise in ignoring the hint at the end of the Report that the number of standards for the declared value should be limited. No doubt makers of apparatus are compelled to design for a limited number of standards, but consumers in districts where the calorific value does not agree with that for which the apparatus is designed are suffering from an unnecessary loss of efficiency.

The Board suggested that four standards, 400, 433, 466, and 500 should suffice for the whole country. Actually, it would not be far from the truth to say that gas in Greater London (with the formidable exception of the district served by the South Metropolitan Gas Company) is supplied at 500 B.Th.U. In the rest of England and Northern Ireland it is supplied at 450-475 B.Th.U., and in Scotland as low as 400. The single value which claims the greatest number of undertakings and the greatest volume of gas is 500 B.Th.U.

No doubt there are excellent reasons for the maintenance of the 500 B.Th.U. standard in the London area. But in the provinces undertakings using the continuous vertical retort, or a combination of horizontal retorts and water gas, should have no difficulty in working to either of two standards, say, 475 where the coal is rich and a good coke market available, and 450 in other cases, while in Scotland a standard of 425 or 400 would present no difficulty. Four standards, then, appear to be sufficient, though of slightly different values from those suggested in 1919 by the Fuel Research Board.

The choice of a declared calorific value is influenced by several other factors besides that of the capacity of the distribution system which, indeed, should not be allowed to have undue weight. But the one factor which is of paramount importance is that of the price ratio between coal and coke.

I have already shown ("Ten Years Carbonizing in Vertical Retorts," Institution Communication No. 49, June, 1932) that unless coke realizes more than 10% more than the cost of coal, gas is made more cheaply at the lower than at the higher calorific values in continuous vertical retorts. And it must be considered that any additional cost for the preparation of the coke for the market should be deducted from the realized price. Indeed, it is questionable whether, in view of the rapid and even unforeseen variations in the coke market, it is good policy to be diverted from the most effective utilization of the coal available for the production of saleable gas by the allurements of the possibility of producing a coke which may, for a time, command a slightly higher price in a market which may prove disappointing at very short notice.

Table 1 indicates, in perhaps a more convincing manner than the chart appended to the 1932 aper, the effect of variations in the coal-coke price ratio on the relative cost of gas at the calorific values of 500 and 450 B.Th.U. per cu.ft.

It will be seen, taking the middle column, that when coal and coke are equal in value the net coal cost of gas at 500 B.Th.U. is 1·143d., whereas at 450 it is only 1·022d., a reduction of more than 10%. Whenever coke realizes a price 25% in excess of that paid for coal, gas can be made very slightly cheaper at 500 than at 450 B.Th.U., but if coke should realize

20% less than the price paid for coal, gas is made at a very much less cost at 450 than at 500.

TABLE 1.

Annual Make (1937) = 3,078,000 Therms.
Average Weekly Make = 59,192 Therms.

—	Calorific Value, 500 B.Th.U./Cu.Ft. Gas Yield, 70 Therms/Ton Coal.					
Coal/Coke Ratio.. ..	20/25		20/20		25/20	
	Per Week.	Per Therm.	Per Week.	Per Therm.	Per Week.	Per Therm.
	£	d.	£	d.	£	d.
Coal—						
59,192 = 846 at 20s. ..	846					
70 at 20s. ..			846			
at 25s. ..					1,057	
Residuals—						
Coke (10 cwt./ton) = 423 tons at 25s. ..	529					
at 20s. ..			423			
at 20s. ..					423	
Tar (12 galls./ton), 10,152 galls, at 3·34d... ..	141		141		141	
	—670		—564		— 564	
Net cost of coal ..	176	0·714	282	1·143	493	1·999

—	Calorific Value, 450 B.Th.U./Cu.Ft. Gas Yield, 84 Therms/Ton Coal.					
Coal/Coke Ratio.. ..	20/25		20/20		25/20	
	Per Week.	Per Therm.	Per Week.	Per Therm.	Per Week.	Per Therm.
	£	d.	£	d.	£	d.
Coal—						
59,192 = 705 at 20s. ..	705					
84 at 20s. ..			705			
at 25s. ..					881	
Residuals—						
Coke (8·4 cwt./ton) = 296 tons at 25s. ..	370					
at 20s. ..			296			
at 20s.					296	
Tar (16 galls./ton), 11,280 galls. at 3·34d... ..	157		157		157	
	—527		—453		— —453	
Net cost of coal ..	178	0·722	252	1·022	428	1·735

Benzole.

The subject of benzole recovery is receiving increasing attention throughout the Gas Industry to-day. It seems imperative that every effort should be put forward to make the country self-supporting for supplies of liquid fuel, but one must not overlook the relative insignificance of the quantity of benzole which could be extracted from crude town gas, even if every undertaking adopted the practice. The conclusions of the Falmouth Committee on Oil from Coal are illuminating on this point. In 1936, 51 million gallons of motor fuel was the result of benzole recovery at gas-works, coke ovens, and tar distilleries combined. It represented only 4% of the total requirements, and gas undertakings contributed only one-quarter of that. The practical limit of production would appear to be reached when a further 20 million gallons is added by bringing up the gas-works to the same standard as the coke ovens in this respect. The total production would be some 6% of the requirements, of which gas-works would contribute one-half.

The value of benzole recovery at the gas-works to the economy of the country as a whole is, therefore, problematical. Its value as a revenue producer to the gas undertaking seems to depend again on the price ratio between coal and coke, at any rate in the case of continuous vertical retorts where the calorific value of the gas produced is variable at will. To users of intermittent plant such as horizontal retorts, benzole recovery is no doubt an excellent means of regulating the calorific value of gas sent out on the district, but to the continuous retort user it has no such function.

In the following tables the manufacturing cost per gallon of crude benzole has been calculated for three different coal/coke price ratios on the same basis as that used previously—viz., making 59,192 gaseous therms per week at 450 B.Th.U., and assuming the recovery of 2½ gallons per ton of coal carbonized, which appears to be about the maximum practicable.

Neither capital costs nor labour charges are included in these estimates, but it may be safely assumed that about 1·25d. per gallon might be added to the above costs in each case to allow for these. It will be seen that the cost per gallon is much higher when coke is low in value compared with the cost of coal.

No doubt in proper conditions, such as a favourable market for coke and a suitable type of plant in which the recovery of benzole provides a convenient and ready means of adjusting calorific values to requirements, benzole recovery is a paying proposition. There will always be the attraction that benzole is likely to be readily saleable and to yield a steady return on the capital outlay with low selling costs, but it should be emphasized that each case must be studied in relation to the relevant data before a decision is arrived at.

TABLE 2.—*Influence of the Coal/Coke Price Ratio on the Cost of Benzole Recovery.*

Annual gas sales (1937) .. .. .. 3,078,000 therms
Average weekly sales .. .. .. 59,192 therms
Benzole recovered per ton of coal carbonized 2½ galls.
Declared calorific value, 450 B.Th.U. per cu.ft.
Gas manufactured at, say, 475 B.Th.U. per cu.ft.
Gaseous therms for sale per ton of coal carbonized after stripping say, 72.

Coal/Coke Price Ratio.	20/25.		20/20.		25/20.	
Weekly costs—	£	£	£	£	£	£
1.—Coal 59,192/72 = 822 tons at 20s.		822		822		
at 25s.						1,028
Weekly revenue—						
2.—Coke (9 cwt. per ton of coal)						
370 tons at 25s.	463					
at 20s.			370		370	
3.—Tar (14 gals. per ton of coal)						
11,508 gals. at 3·34d.	160		160		160	
Total revenue ..		623		530		530
Net coal cost ..		199		292		498
Additional charges—						
4.—Make-up wash oil: 1 gal. per 15 gals. benzole. 2,055/15 = say, 130 gals. at 6d.		3		3		3
5.—Water: 60 gals. per gal. of benzole; 2,055 × 60 = 123,300 at 3d. per 1,000 gals. ..		2		2		2
6.—Steam: 50 lb. per gal. benzole met by waste-heat boilers on carbonizing plant ..		—		—		—
Corrected net coal cost		204		297		503
7.—Net coal cost when making gas at 450 B.Th.U. without stripping (see Table 1)		178		252		428
8.—Increase in net coal cost when stripping (excluding labour and capital charges)		26		45		75

TABLE 3.—*Summary.*

Crude Benzole Recovered per Week = 822 Tons Coal × 2½ Galls. = 2,055 Galls.

Coal/Coke Price Ratio (Shillings per Ton).	Cost of Crude Benzole (Excluding Labour and Capital Charges).	
	£ per Week.	Pence per Gall.
20/25	26	3·04
20/20	45	5·26
25/20	75	8·76

While on the subject of benzole recovery it may be of interest to consider what is being done in this direction on the Continent. Enquiries made about 18 months ago elicited the following information relating to the recovery of benzole in gas-works in Germany, France, and Italy.

In the first-named country benzole recovery had been very generally abandoned after the War except in a few of the larger works, but it has been revived recently, particularly in the large and medium works, in response to the command

that Germany shall be made independent of external resources for her supplies of fuel.

In France it is forbidden by law to introduce into gas concessions clauses imposing calorific values susceptible to practical interference with the practice of benzole recovery, and the law provides for powers to compel undertakings to debenzolize town gas before distribution. This law has come progressively into operation, and to-day debenzolizing orders have been taken out for the great majority of the large and medium works, though the fiscal protection of benzole is so low that benzole recovery is rarely a source of revenue to the French gas-works.

The position is very similar in Italy, where a decree was issued in 1925 enforcing benzole recovery in works producing more than 2 million cubic metres of gas per annum (say, 70 million cu.ft.). Such works numbered 28 and represented a total of an approximate annual production of 400 million cubic metres of town gas, whereas the other 147 works produced only 60 million cubic metres between them. As a matter of fact, only a very few of the larger works responded to this pressure because of the poor economic return, but here again, recent years have seen an intensification of Government pressure, and no doubt all the large and medium works are recovering benzole to-day, although it is extremely doubtful whether they are making anything out of it.

Germany has seen that there is another way in which gas undertakings can assist in providing from home resources for liquid fuel requirements. That is by the use of compressed gas for road transport, and it is evident from the Technical Press that developments are taking place in this direction. A reference to this subject relating to practice in this country will be found later in this Paper.

The problems arising out of the supplies of liquid fuel to this country raise questions of the highest order of magnitude and complexity. In an Appendix to the Falmouth Report on Oil from Coal it was stated that the imports of crude oil into this country in 1936 were just over 2 million tons, which would be equivalent to 450 million gallons, and of refined products something more than 8½ million tons, of which nearly 4¼ million (or 960 million gallons) is motor spirit and 2·7 million tons (or 600 million gallons) is fuel oil. The total import of fuel oil would appear to be about 9 million tons, or over 2,000 million gallons.

In proportion to this vast quantity, the amount of oil which is at present being made, or is in the near future likely to be made, from coal, from all sources, is very small indeed.

But if the possibility of replacing naturally-occurring oil by synthetic products at an equal cost is a remote one, the fact that these natural sources are by no means inexhaustible cannot be ignored. Mr. A. W. Beebee, General Superintendent of the Rochester Gas and Electric Corporation, New York, in a Paper read before the American Gas Association last May, made some startling statements about the oil reserves of the United States. It is true that only 10% of our imports are derived from that source, but no doubt the position differs only in degree from that of the other sources of supply.

Mr. Beebee says that "in spite of the present apparent flood of these materials" the known reserves of oil in the United States are not likely to last more than some 12 to 13 years at the present rate of consumption, and that the discovery and development of new reserves during the past five years is considerably below the present rate of use. It is evident that in a comparatively short time, a desperate situation will arise in which natural sources of liquid fuel will be rapidly drying up and artificial means will not be capable of making good a growing deficiency at an economic price. But liquid fuel is applied almost exclusively to the generation of power, and the business of the Gas Industry is to supply heat.

Another possible substitute for liquid fuel for motor transport is compressed gas, but experience so far suggests that nothing but severe economic pressure will induce developments in this direction. If the price of petrol and fuel oil should rise considerably in the not distant future, it is possible that the inconvenience of the special alloy steel cylinders and the equipment of compressing stations for fuelling may be faced for omnibuses and other vehicles running over prescribed courses of no great length, but it is difficult to visualize the use of compressed gas for private vehicles.

Compressed gas has been used in this and other countries for limited supplies to outlying houses and villages, but for the moment this small field is occupied by "Calor" gas, a by-product of the hydrogenation and oil refining processes.

Tar.

This by-product is not to-day producing such a revenue as one would like to see. The coming of the motor car produced a demand for a road surface with very different qualities from those with which our fathers had been satisfied, and this demand was met by the use of tar and its rival bitumen. For the moment the supply of the latter is cheap and plentiful, and tar is barely holding its own. But the admirable work of the British Road Tar Association, under Mr. W. E. Cone, is enabling tar to meet the technical requirements of the road makers, and the systematic development of the roads which is now going forward in this country justifies a considerable degree of optimism. The correct use of tar for the preparation of tarmacadam for the making of new roads, the thin tar carpet for improving and maintaining the surface of roads, particularly with non-skid characteristics, and for surface dressing direct, are all matters which are being actively investigated by the British Road Tar Association. To quote Mr. Cone on the last-named subject, "the binding or adhesive properties of tar make it particularly suitable for application to all types of surface. The ease and facility with which tar wets a particular surface and retains the full value of its adhesive properties, while being gradually converted into a solid, is one of its most striking characteristics. This ensures a tenacious bond for the retention of chippings, and it is in this respect that tar has proved so successful in the provision of non-skid surfaces."

Consequent upon the revival of the iron and steel trade, the increase in total tar output in the past six years has for a time outgrown the demand for road tar, and the additional tar has been distilled to pitch and creosote. The latter has been well absorbed mainly for hydrogenation, but pitch has presented difficulties. The briquette trade, which was the natural market for pitch, has been in difficulties due to the rise in price of small coal. Very large quantities of pitch are being consumed as fuel, and it is thought by at least one authority that the best hope of a really new outlet would be in the use of pulverized pitch as a substitute for oil fuel. It is interesting, indeed, to note that the tar industry is to-day really a fuel industry, and the problems of the tar trade are largely considerations which enter into the general competition between different forms of fuel.

While on the subject of tar, attention may be called to the use of the electrical precipitation of tar in gas-works. This apparatus has been found of very great advantage in dealing with tar fog and improving the operation of oxide purifiers. At Carlisle the electrical de-tarrer is placed immediately after the exhausters. Before it was installed the tar fog passing to the purifiers was as high as 36 grains per 100 cu.ft., but the quantity now passing is negligible. The Livesey washer and the scrubbers are now completely free from tar and, in consequence, the liquor passing to the sulphate plant has considerably improved.

The de-tarrer has been in operation about 12 months, and during that time no new oxide has been charged to the purifiers, so that the full benefit has not yet been obtained. But a decided improvement in the activity of the oxide has been observed and only six boxes have been changed since electrical precipitation was used, against nine for the same period during the previous two years. The last two boxes were worked up to a net sulphur content, on the wet basis, of 53·75% and 56·45%, an increase of over 8% on previous practice. Excessive back pressure has disappeared, and no trouble is experienced in working the boxes in either direction.

Naphthalene has been reduced from an average of 9·6 grains to 7·7 grains per 100 cu.ft., and this is rapidly decreasing, the last two tests at the time of writing showing no appreciable naphthalene at all. Our tentative explanation of this phenomenon is that the naphthalene was carried into the purifiers by the tar fog and evaporated there as the temperature increased.

I have appended to this Paper a statement showing the

financial advantage secured by the installation of the electrical de-tarrer.

Ammonia.

This is one of the most difficult problems of the Gas Industry. Experience of the last few years shows that the larger and more efficient by-product plant can stand up to the competition of synthetic ammonia and make a moderate profit, but it must be admitted that no very satisfactory method of handling ammonia from small works has yet been devised. The concentration of liquor, transported to central works, seems to be the only possibility in this direction, but, for the moment, the melancholy fact must be registered that most of this once valuable by-product is being discharged to the sewers with as little inconvenience as possible. It is to be hoped that the leaders of the Industry will not regard this as a satisfactory solution of the problem and that the efforts to find new outlets for ammonia will not be relaxed

Coke.

Coke is, of course, by far the most important of the by-products of gas manufacture. This solid residual of the high temperature dry distillation of coal is, in practice, though not perhaps in the theory of some politicians and special pleaders, the Nation's smokeless solid fuel, and great strides have been made in its preparation for the market.

In 1932 it was true to say of our experience in Carlisle that " the comparatively low price per ton for the coke available for sale is a matter for serious concern." But we claimed then, and we still claim, that the coke produced in the continuous vertical retort, provided that it is the result of the distillation of reasonably clean coal, completely fills the requirements of a smokeless solid fuel for the open grate.

It is probable that English people will long wish to retain one open fire in the home, and if that fire is to be innocent of smoke, coke is the only fuel which will fill the bill at a reasonable cost. And then continuous vertical retort coke (or " dry vertical coke," as it gets to be known in districts where the sale is pushed) is more readily ignitable than any of its competitors and, being dry-cooled within the carbonizing system itself, it burns without " spitting." Its marketing does, however, present certain problems. This valuable ignitability is due to the porosity and relative friability of its structure. Great care, therefore, is necessary in the design of the machinery for grading it, and it is also necessary to de-dust it at the point of loading to bags.

Considerable advance has been made in the design of coke screens during recent years. Mr. Dixon's' witty dictum that " Their name is legion but there still remains the choice of evils," is perhaps still to some extent true, but it is also true that the vibrating mesh screen does succeed in grading coke with less breakage and with more precision (a much better word than efficiency, by the way) than most of the older designs. The necessity for de-dusting may yet lead us to the installation of fans exhausting dust-laden air from all points where coke is being graded or loaded into bags. The removal of this very fine dust will materially assist in curing the dust nuisance when discharging into the consumers' fuel store.

The modern installation of coke-grading plant would probably include the following apparatus:

1. A preliminary de-breezing screen probably composed of fixed bars, perforated plates, or wire-meshes to remove roughly the fines through $\frac{3}{8}$ in.
2. A screen of the grizzley type, or some other robust design, to take off the large coke—a process called scalping—passing over $2\frac{1}{2}$ in. diameter; this large coke being passed to a coke cutter when more of the smaller sizes is required.
3. One or two vibrating mesh screens to grade the coke into two or three intermediate categories.
4. Final de-dusting screens also of the vibrating mesh type between the outlets of the hoppers and the bagging or other loading apparatus.

It is possible that if the market is to be held in the future, apparatus of quite this complexity will be required in the preparation of all coke for sale. But even so, the real price which coke will be able to command with any approach to stability depends upon the price of household coal. In our experience prices last year soared to 37s. 6d. per ton f.o.b. for export. But this was quite abnormal. This year—probably owing to the mild weather—coke was almost unsaleable, and the minimum price fixed by the Gas Coke Export Association fell to 27s. 0d. per ton. Taking Carlisle as an example, the average price of household coal is approximately 25s. per ton, and there seems no reason to doubt that coke prices will be stabilized at a figure not higher than this.

Smoke Abatement.

The subject of smoke abatement is likely to become more important in the coming years. It is unlikely that civilized people will put up very much longer with the emission of smoke from either industrial or domestic chimneys, and at any time we may find ourselves faced with a situation in which such emission will constitute a punishable offence against the law. But the legislature is not likely to take such drastic action as this implies until it is shown that, as a matter of fact, smoke from the domestic chimney can be abolished without hardship to the working people.

The Gas Light and Coke Company, as Sir David Milne-Watson told us again in Glasgow some months ago, has now proved in the Kensal House experiment that the combination of gas and gas coke can effect a positive saving, and not an increase, in the cost of fuel in the home of the worker. When similar experiments have established this point there will be an immense demand for coke, a demand so great that the Gas Industry itself will possibly not be able to satisfy it.

The weight of coke available from the Gas Industry is in the neighbourhood of 8 million tons per annum. It is probable that the demand for domestic purposes alone, if the Kensal House system becomes general, will be of the order of 20 millions. There will, therefore, be plenty of room for the coke oven industry to dispose of even more coke for domestic purposes than it does at present.

Ancillary Plant.

Time does not permit of an adequate account of the developments which have taken place during the period under review in the ancillary gas-works plant. Condensers have been considerably improved in detail, though the principle remains the same. It is possible that one day refrigeration may be resorted to; the necessary ammonia is already a waste product which in this way might find a profitable use.

The introduction of the turbo-exhauster has only been practicable in the larger works. Washers and scrubbers of some new types have been introduced, and improvements have been made in the design of purifiers, but no strides have been made with liquid purification, which at one time promised to make a decided reduction in the very large ground area which this part of the gas-works plant still occupies.

Considerable advance has been made in the scientific equipment of the gas-works. The use of automatic weighers in connexion with separate units of plant has enabled a more accurate check to be kept upon the weights of coal carbonized, coke to producers, and coke sold. The pyrometer is in daily use in the modern retort house, while recording instruments are freely used to control pressures and temperatures and the composition of waste gases from retort settings. The laboratory has become an important and regular feature even of the small gas-works, and the practice of a regular analysis and control of coal supplies is becoming general. The recording calorimeter is almost compulsory for checking the composition of the gas made and sent out to the district, while specific gravity recorders are also frequently used. All this is an indication of the successful efforts made to supply consumers with gas of that constant composition and quality which is necessary to get the best out of modern appliances.

I am conscious that there are many other subjects to which reference should have been made had time and space permitted. Waste-heat recovery and the use of the pressure producer, in which breeze can be consumed, have developed rapidly in the last few years. And I have made no attempt at all to deal with one of the most important elements in gas-works practice, that of refractories. Refractory materials lie at the very heart of carbonization, but their composition and their behaviour under heat and in the presence of the impurities of coal present a problem the complexity

of which is perhaps not fully realized in Scotland, where coals give off their gas at relatively low temperatures, and contain ash with no deleterious action upon the refractories.

But these materials are in the safe hands of the British Refractories Research Association under the able direction of Mr. A. T. Green, and we may hope that with cordial co-operation between manufacturer and user the present high standard of quality of these materials will be still further improved upon.

The Future.

One enters into prophecy always with trepidation, but never with more than I do on this occasion after the leaders of the Industry, and particularly Sir David Milne-Watson, have so recently pronounced upon the future prospects of the Gas Industry.

"It is because the Gas Industry," said Sir David Milne-Watson at Glasgow in June, "is uniquely fitted to provide heat in scientific form in a period of increasing industrial efficiency and rising standard of home life that its future will be no less important than in the past."

It may be that we can safely leave the industrial field to the industrialist. As long as we have the best and most efficient fuel the industrialist will buy it in the long run. But the domestic field is subject to factors which are not entirely economic. Sir David estimated that to-day "of the total domestic demand for heat 53% is met by bituminous coal, 4% by anthracite, 19% by coke, 1·5% by electricity, and the remaining 3·5% by oil and kerosene." It is generally stated, with what authority we do not quite know, that 40 million tons of coal is consumed in the domestic grate. It is possible that for the purpose of the present statement this figure should be heavily discounted. It is a figure which has not been revised for the last 40 years, and it includes all those cases in which neither gas nor any other alternative form of fuel is within reach.

It may be that no more than 20 million tons of bituminous coal actually remains to be replaced partly by gas and partly by an alternative solid fuel which, in the future, must be smokeless and for which coke is the only practical source of supply.

The magnificent experiment of Kensal House has shown that the gas and coke system can provide for the full demands of the working-class home at a cost no more than is being paid at present for coal and gas. The Gas Industry is thus shown to be in possession of a complete solution for the only remaining, though very difficult, portion of the smoke abatement problem, that of dealing with the vast numbers of small house chimneys which are now polluting the atmosphere more than anything else. "The future of the Gas Industry in domestic supply," said Sir David Milne-Watson, "lies in the rationalization of fuel service for heat by the concentration of the main cooking, space heating, and water heating loads under one set of distribution costs. For some years to come a smokeless solid fuel will necessarily split the space heating loads; that fuel the Gas Industry possesses in coke."

But the domestic fuel market, particularly, is dominated by other considerations which are by no means confined to the sphere of economics. To some extent the market is influenced by what can be called "mass psychology." The power of advertising and suggestion is invoked to create the impression that gas is somewhat out-of-date, old-fashioned, not in the best taste, and so on. The efforts of the B.C.G.A. to combat this, however, by good-class advertising in the best journals and by other propaganda are no doubt being, to some extent, rewarded with success. If all gas undertakings realized how much this work is to their interest they would support it more readily than they do at present. No more stupid prejudice could be imagined than that one form of energy is in any better taste than another.

If the rival advertisers were left a fair field in which to fight out their battle, the victory would ultimately go to the "better man." But, unfortunately, the scales are weighted in favour of one of the combatants by the intervention of the Government, both National and Local. The National Government intervenes by virtually subsidizing the electrical industry and encouraging it to compete in the domestic and other space heating and cooking markets to which it is scientifically and economically unsuited. Local Governments, even when they own both the gas and electricity undertakings serving their constituents, often favour the younger rival, while if they only own the latter they are generally positively unfair in their attitude towards the former.

The decisions in these matters should not be left to politicians, whether National or Local, but should be entrusted to those competent to give them. Possibly the future will see a Central Fuel Authority with a scientific personnel acting in independence and permitted to deal with the problem of the supply of heat, light, and power as a whole, uninfluenced by any other motive than that of applying the potential energy of coal to the several problems of power transmission, lighting, and heating in the most economical. hygienic, and convenient manner.

APPENDIX.

Further Information Relating to the De-Tarrer.

Purification—
Make of gas .. .. 700 million cu.ft. per annum
Average H_2S content .. .. .. 4·51 grns. per cu.ft.

Wt. of H_2S to be removed .. .. $= \frac{4{\cdot}51 \times 700{,}000{,}000}{7{,}000}$

$= 451{,}000$ lb.

34 lb. of H_2S contain 32 lb. of sulphur.

$\therefore$ Wt. of sulphur to be removed $= \frac{451{,}000 \times 32}{2{,}240 \times 34} = 189{\cdot}5$ tons

The average net sulphur content of spent oxide, with no de-tarrer, was 44%.

$\therefore$ Wt. of spent oxide per annum $= \frac{189{\cdot}5 \times 100}{\cdot 44} = 430$ tons

To arrive at the wt. of new oxide, the difference in weight due to loss of moisture and gain in sulphur in the spent oxide increases the weight from 150 tons to 165 tons.

Wt. of new oxide required then $= \frac{430 \times 150}{165} = 391$ tons

Wt. of spent oxide if net sulphur content is 56% with the de-tarrer in operation

$= \frac{189{\cdot}5 \times 100}{\cdot 56} = 338$ tons

Wt. of new oxide required per annum

$= \frac{338 \times 150}{165} = 307$ tons

Comparative Costs With and Without De-Tarrer.

	£	£
Expenditure without De-Tarrer—		
391 tons new oxide at 35s. ton	684	
9 boxes emptied and filled	675	
Loading and unloading oxide	41	
Gas loss—16,000 cu.ft. per box at 1s. 6d.	10	
Total	1,410	
Income—		
430 tons spent oxide at 3¼d. per unit of 44% sulphur ..	276	
Cost of purification		1,134
Expenditure with De-Tarrer—		
307 tons new oxide at 35s. ton	537	
6 boxes emptied and filled	450	
Loading and unloading oxide	32	
Gas loss—16,000 cu.ft. at 1s. 6d.	7	
Total	1,026	
Income—		
338 tons at 4¼d. per unit of 56% sulphur	374	
Cost of purification		652
Balance in favour of de-tarrer		£482

Summary, including current, maintenance, capital, &c.—

Balance		£482
Current	£41	
Maintenance	19	
Capital	220	
		280
		£202

Discussion.

The PRESIDENT said that Mr. Blundell had given them a Paper which was the result of a lifetime's experience. In 1917, 1922, 1929, 1931, 1932 he had contributed papers on vertical retort practice. He was a master of his subject.

Mr. JAMES JAMIESON (Edinburgh) said that much of Mr. Blundell's life had been spent on carbonization plant which had its origin in the oil works of Scotland. It was left to him to discover and to show the Industry the tremendous possibilities of the carbonization of coal in continuous vertical retorts. Introducing steam as a definite and deliberate part of the procedure he demonstrated the high efficiency and the wide flexibility of plant of that description and undoubtedly paved the way for that great variety of declared calorific values which they found throughout the country to-day. According to the Board of Trade returns, 53 Scottish gas undertakings required eleven different declarations ranging from 500 to 375 B.Th.U. That on first sight appeared formidable, but on examination it lost much of its significance as 82·56% of the gas was supplied at or above 450 B.Th.U.

In 1932 Mr. Jamieson presented a Paper to this Association entitled "Calorific Values and their Relation to Working Costs and Results," and advocated a reduction in the number of different

declarations, putting forward the same grouping as Mr. Blundell now suggested. He went further and said "With prices ruling when these notes were prepared, one may conclude that with average Scotch coal the most economical quality of gas to produce is 450 B.Th.U. A change in the price of coal or residual products would immediately alter the position, but from whatever angle I have approached the subject I have been impressed with the consistency of the results and costs following the middle range of quality, so much so that I consider it would make an efficient and ideal standard for Scotland."

He was afraid, however, that while he convinced himself he did not convince many of his colleagues, as the only changes which had taken place since were: Edinburgh, 500 to 475 B.Th.U.; Paisley, 500 to 450; Coatbridge, 475 to 500; and Motherwell, 400 to 425. These changes, it would be noted, were all within the groups suggested by the Author but showed no consistency in their application. That was indicative of the general feeling in Scotland, if not throughout the Industry, towards this important subject. Mr. Blundell put forward five declarations to meet the requirements of the whole country and evidently favoured, for reasons which he did not disclose, a quality for Scotland of 425 to 400 B.Th.U. It would be interesting to know why 450 B.Th.U. had been adopted at Carlisle. Mr. Jamieson would also like to know why the Author favoured 500 B.Th.U. for London in comparison with, for instance, 425 for Edinburgh. The average price of coal less coke for the last three years for the Gas Light and Coke Company was 1·65d., for the South Metropolitan Gas Company 1·55d., and for Edinburgh 1·28d. He would have thought that the net cost of coal would have applied in determining the calorific value as forcibly to London as to the provinces. Again, if they took Mr. Blundell's groups and took as an example an undertaking in Scotland supplying each quality the difficulty in justifying the allocation became more apparent.

Analysis of Accounts—Average of Past Three Years.

Declared Calorific Value.	Coal *less* Coke Price per Therm.
500	1·40d.
475	1·28d.
450	1·21d.
425	1·73d.
410	1·77d.
450	2·02d.

These were individual cases, but they were the average of three years and were fairly representative. The lowest price per therm was returned at 450 B.Th.U. followed by 475 B.Th.U.

In 1932 Mr. Jamieson said he gave the results and costs of producing gas at these different qualities, and an interesting comparison emerged if they compared these figures with the costs quoted for the individual undertakings.

Declared Calorific Value.	Coal *less* Coke Price per Therm.	Edinburgh Results.
500	1·40d.	1·41d.
475	1·28d.	1·30d.
450	1·21d.	1·10d.
425	1·73d.	0·92d.
410	1·77d.	0·86d.

At and above 450 B.Th.U. the costs were closely related, but below 450 the Edinburgh costs were much lower and more in keeping with what one expected from the production of low quality gas. These results were obtained under actual working conditions and were in no sense experimental. The make of gas per ton of coal carbonized increased in each test with remarkable regularity, 41·5 therms or 50% more being produced at 400 than at 500 B.Th.U.

Using a Wigan Arley coal the Research Department of West's Gas Improvement Company estimated theoretically 49 therms or 60% increase, and under working conditions produced 36·4 or 41·5%. The mean of these figures confirmed the Edinburgh results. He estimated that not more than 12 therms per ton separated the best and the poorest recognized Scotch gas coal, and on that account it was difficult to understand why higher thermal yields were not returned by undertakings supplying gas below 450 B.Th.U. In Edinburgh they took their supplies from the Lothians, Stirlingshire, Lanarkshire, and Ayrshire, and last year they produced 76·5 therms *plus* one gallon of benzole per ton of coal carbonized at 475 B.Th.U. They would therefore expect to produce 88 therms at 450,102 at 425, and 116 at 400 B.Th.U., *plus* a similar amount of benzole. He believed these results were possible if proper retorting conditions were provided, coupled with closer attention to the size and mixture of coal rather than to actual quality, but he would be glad to have Mr. Blundell's view. If gaseous yields in keeping with what was theoretically expected from the production of low quality gas were not attainable in practice there was no justification for declaring a low calorific value. Apart from that, however, he was doubtful if any progress would be made in the standardization of calorific value until the production and sale of coke was co-ordinated and strictly regulated throughout the whole country. That, in his opinion, was more pressing at the moment than any other problem before them.

In an unrestricted market the price of coke to-day would not be more than 20s. Indeed, it was doubtful if the market would absorb production at a price even substantially below that figure. With the increased quantities of furnace coke now available the future outlook was by no means bright, and he personally could see no alternative but a reduction of the calorific value of the gas or the development of the domestic market in competition with coal. They had meanwhile adopted the latter policy by offering coke fires on hire-purchase. When they reduced the quality of gas from 500 to 475 B.Th.U. they reduced the quantity of coke for disposal by 12,000 tons per annum, and they estimated if they now stepped down to 450 B.Th.U. the coal consumption would fall 21,600 tons and coke by 18,000 tons. To place anything like that quantity of coke on the domestic market, no matter how forceful their selling policy might be, would take years; so it looked as if they would have to adopt both proposals unless the position altered materially in the immediate future.

Distribution.

He agreed with Mr. Blundell that under normal conditions the capacity of the distribution system should not be allowed to have undue weight on a decision of this kind. In Edinburgh, however, with a statutory area of 116 square miles, the gas being supplied from one works under booster pressure, distribution assumed considerable significance. With coal and coke at present prices they would save only £800 per annum in changing from 475 to 450 B.Th.U. That sum would not meet the extra distribution costs involved. Over the last twenty years their average price of coke had not been less than the purchase price per ton of coal, and, bad as the market looked, he did not think it would do so in the future. With coal and coke at 22s. the production of 450 B.Th.U. gas in their case would show a saving of £5,600 per annum, so that if the assumption made by Mr. Blundell that the price of coke would be stabilized at or about the same price of coal proved correct, it looked as if a change in their declared calorific value could not be much longer delayed.

Mr. JAMES BELL (Dumbarton) congratulated Mr. Blundell on another addition to the many interesting papers he had already given. There was a controversy on the subject of the price per therm to the holder, but there were certain circumstances which made comparisons difficult. They heard of low calorific gas being produced at a low figure and again at a high figure. Distance from the coalfields and the cost of carriage entered into the question. They had to take into consideration the state of the plant in any year for which the results appeared. Some plant had to carry on for eight or ten years without any repairs, and its efficiency was therefore reduced. All these factors had to be taken into consideration before a man could say he was producing a cheaper therm than his neighbour. They did not know enough of the circumstances to be sure in their deductions.

Mr. R. ROBERTSON (President of The Institution of Gas Engineers) said that Mr. Blundell had given them an admirable outline of the problems in the Industry. He had mentioned the ever-pressing problem of carbonization, with its delicately balanced economics, and Mr. Jamieson had emphasized how difficult that problem could be. To Sir Frederick's list of qualifications for gas engineering they would have to add a knowledge of accountancy. Mr. Blundell had mentioned tar, benzole, coke, ammonia, and he had emphasized the need for the gas engineer of the future to have a high standard of educational qualifications over and above his technical knowledge. He had stressed the necessity for flexibility in the plant designed for the future so that those who planned ahead had to regard flexibility as something to aim at. He had also emphasized the need for a National Fuel policy to co-ordinate conflicting tendencies. They were all agreed that smoke prevention was a national duty; yet the Fuel Board was studying how to promote and prolong the combustion of raw coal in open grates. It was almost criminal that this national asset of coal should be treated in such a casual way and should be left to the mercy of expediency and political contingencies. It should be added that the papers they had heard that day dealt almost entirely with the technical aspect of the gas profession. That was as it should be in an audience of technical men. Technical men and salesmen with high qualifications were both needed, and only when both co-operated were they likely to get the best results in their Industry.

Dangerous to Dogmatize.

Colonel W. M. CARR said he agreed with the remarks of Mr. Bell regarding the institution of comparisons. It was dangerous to be too dogmatic as to what was most suitable. After all, plant suitable in one place might not be the most suitable elsewhere. There were factors which affected all carbonization plant results, as, for example, the type of coal and its cost. Many of them were worried about the coal situation in the future, and if prices were to be brought to a common level and they were to be com-

pelled to pay the same price for inferior coal as for coal of better quality they would have to revise their ideas very considerably and try to use the minimum amount, instead of the maximum. Those in the Industry would use coal to the best advantage if they were supplied with it at fair and proper prices. Otherwise, they might be driven to use the least amount of coal possible, and the consequent reduction in gas and coke would perpetuate the smoke evil. It was to be hoped that coalowners would appreciate that it was to their interest to supply coal on the best terms to ensure that more would be used in the Industry.

Dealing with the coke question, Colonel Carr said that if the market was to be maintained and developed, as it must be in the interests of all, they should be extremely careful to see that their carbonization process produced the best quality and that they prepared it for sale with the utmost care. They should give a dust-free and clean article. With regard to the benzole question, he did not quite agree that it was not a vital matter. To his mind it was very important that they should continue to produce that 4% mentioned. It was part of their business of making the best use of coal and from the point of view of economics, even with vertical retorts where they could not look for so high a yield, Mr. Jamieson had pointed out that it was worth at least 1d. per 1,000 cu.ft. There were instances where it was uneconomic to produce benzole, but these cases were in the minority. He could not agree with Mr. Blundell on that point.

Mr. R. W. COWIE (Hawick) said he agreed entirely with what Mr. Jamieson had said concerning coke. They were all paying five or six shillings more per ton of coal than they did a few years ago. Why should they not get five or six shillings more for their coke? If the coal price rose so should the coke price. In Scotland they had lost the tide by not forming some association to keep the price of coke up. Even though the price were reduced no more would be sold. They were trying in Hawick to popularize it for domestic consumption. There also in three years they had more than paid for the cost of benzole plant and were looking forward to increased profit. Gas companies should sell their coke direct just as they sold gas. Houses were going up in Hawick with fires for the use of coke. Local merchants had no interest in its sale but wanted merely to sell coal.

Mr. A. S. NISBET (Paisley) said there was a certain melancholy appropriateness in Mr. Blundell, on the eve of his retirement, giving them this interesting excerpt from his life's work. The old order was ever changing, but Mr. Blundell had shown that at every stage of its history the Gas Industry had sufficient virility and power to meet new conditions. They were grateful to Mr. Blundell for his great services to their Industry.

Mr. R. D. KEILLOR (Greenock) said the difficulties set forth by Mr. Blundell as facing their Industry were huge, while Sir Frederick had enumerated their difficulties in training a staff. He wondered if they could not find a short cut through their troubles by training research workers who could translate some of their problems into plain language.

Mr. T. S. LOCKHART (Rothesay) said it had been interesting to hear from Mr. Blundell of the early difficulties and trials encountered in raising coal carbonization to its present level. In Rothesay the complete output of coke had to be sold for domestic purposes, the only alternative being shipment at uneconomic rates.

Mr. BLUNDELL, replying to the discussion, said that some of the points raised had been dealt with already by Mr. Bell and Colonel Carr. He had meant nothing in the Paper in a dogmatic way. He did not say that one man should produce gas at 450 B.Th.U. He might be able to prove it should be 500. None of them could buy the same coal as another or have the same outlet for their coke. He was telling no man what he should do. The Gas Industry was in capable hands. The younger generation was going to pay a great deal more attention to the production of gas than the older generation. He looked forward with optimism to the future of the Industry. He had given his own impressions and experiences, and it was a delight to sit and listen to what other people thought. He did not know whether he was half Scotch or Scotch or English—but though he would not be coming among them again as a member of the Industry he hoped to cherish happy recollections of days spent in Scotland and trusted some good would come from his contributions to their Association.

Athletic and Social

Ramsgate Annual Walk.

The Ramsgate Gas and Water Athletic Club's annual "walk" has proved once more a very successful event. The winner of the event, C. Costin, had a 83 minute start, the fastest time being made by G. Dawes.

Cardiff Amateur Boxing Club.

At the opening of the season the Cardiff Gas Amateur Boxing Club had a welcome visitor. Ben Foord, the South African champion, broke his training for his fight with George James in order to pay the Club a visit and see the members going through their paces. Foord congratulated the trainer, Alf Gallie, on his fine work.

Dover Swimming Successes.

The Dover Gas Company Sports Club (A. Rider, H. Payne, E. Cook, and L. Brown) won the relay race against the Folkestone and Canterbury Gas Companies at Folkestone Swimming Pool on Sept. 13. On the following day the Company's team had a further success in winning the Business Houses relay race at the annual swimming sports of the Dover Police Force.

Richmonds' Recreation and Social Club.

The Cricket Section have won the "J. E. White" Inter-Works Knock-out Competition. This is open to all Works Cricket Teams in Warrington, and there was an entry of 18. The Richmond Team also won the final event, Winners *v.* The Rest. At the close of this match the Cup and individual Medals were presented by the Warrington Town Clerk, and Mr. Maurice H. Thornton (Director of the Company) responded on behalf of the Cricket members.

The Horticultural Section held their fourth Annual Show last Saturday, and the judges of the various sections expressed the opinion that the standard was higher than in previous years. The proceedings were opened by the Mayor and Mayoress of Warrington.

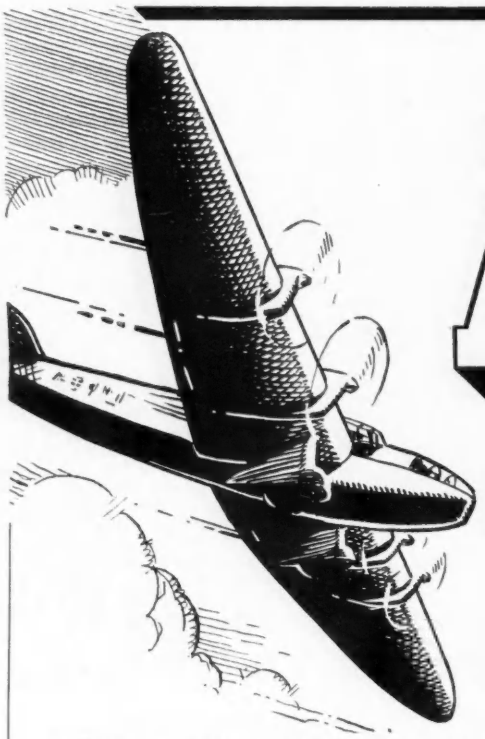
Rotherhithe Co-Partnership Institute Outing.

There seems to exist a very sound agreement between the Clerk of the Weather and Mr. Fred Hills, who, as in previous years, was responsible for the organization of the annual outing of the Rotherhithe Co-Partnership Institute of the South Metropolitan Gas Company to Southsea on Sept. 4. His party, Pope might well have said, always "warms in the sun, refreshes in the breeze." Good friend though the Clerk of the Weather might be to Mr. Hills, we feel sure he would not grudge Mr. Sid Hardy his meed of praise for the splendid manner in which he helped to make the outing the success it was. One feels that even were the sun to play truant Mr. Hardy's radiant cheerfulness would quite make amends for any shortcoming in that direction.

After a very pleasant run down from London by road, lunch was taken at the Royal Pier Hotel, when the chair was taken by the Station Engineer, Mr. T. A. Canning, whose health was drunk on the proposition of Mr. J. R. Edwards. Mr. Canning briefly replied, and the visitors left the hotel to indulge in the thousand-and-one amusements this modern pleasure resort claims to offer. Tea was very much appreciated at the Hotel, after which the party made its way (by easy stages!) back to London.

A FLORAL SLOGAN

A garden corner of the Wishaw Gas-Works has been set out in the form of this ingenious floral slogan, which reads: "Gas Like the Sun Never Fails."



A.R.P.

BRADDOCK'S

OIL SEALED

AUTOMATIC RELIEF VALVE

(PATENT APPLIED FOR)

SHOULD THE EXHAUSTER STOP OR A BLOCKAGE OCCUR IN THE WORKS MAIN, VALVE RELIEVES PRESSURE IMMEDIATELY AND SEALS AGAIN AUTOMATICALLY WHEN NORMAL CONDITIONS RETURN.
CAN BE SET TO "RELIEVE" AT ANY PRE-DETERMINED PRESSURE.

AUTOMATIC IN ACTION

ROBUST AND RELIABLE

PRICES AND PARTICULARS

APPLY TO **J. & J. BRADDOCK**
(BRANCH OF METERS, LTD.)
45/47, WESTMINSTER BRIDGE ROAD, LONDON, S.E.1
GLOBE METER WORKS, OLDHAM, AND
49/51, ABLOW STREET, WOLVERHAMPTON

Braddocks are Best

Markets and Manufactures

Current Sales of Gas Products

The London Market

LONDON, *Sept.* 19.

There is little of interest to report in the values of Tar Products, to-day's prices being as follows:

Pitch, nominal at about 33s. per ton f.o.b.
Creosote, about 4½d.
Refined tar, 3¾d.
Pure toluole, 2s. 2d. to 2s. 3d.
Pure benzole, about 1s. 9d.
95/160 solvent naphtha, 1s. 7d.
90/160 pyridine, 10s.
All per gallon naked at makers' works.

The Provinces

Sept. 19.

Crude Gas-Works Tar, 15s. to 20s.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 31s. to 32s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 31s. to 32s.* Toluole, naked, North, 1s. 7¾d. to 1s. 9d. Coal tar, crude naphtha, in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5d. Heavy naphtha, North, 1s. 3d. to 1s. 3½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4¾d. to 4¾d.; low gravity, 4¼d. to 4½d. Carbolic acid, 60's, 1s. 9d. to 2s. Naphthalene, £13 10s. to £16. Salts, 70s. to 75s., bags included. Anthracene, "A" quality, 4¼d. to 4½d. per minimum 40% purely nominal; "B" quality unsalable. Heavy oil: Unfiltered heavy tar oil, min. gr. 1,080, 4¼d. to 4½d.; filtered heavy tar oil, min. gr. 1,080, 5¼d. to 5½d.; heavy tar oil, gr. less than 1,080, 4¼d. to 4½d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Scotland

GLASGOW, *Sept.* 17.

Consumers still lack confidence and very little new business is being placed. Prices accordingly remain unstable.

Crude gas-works tar.—Actual value is about 37s. to 38s. per ton *ex* works in bulk.

Pitch remains a dull feature at about 25s. per ton f.o.b. for export, and 23s. per ton *ex* works in bulk for home trade.

Refined tar.—Price is maintained in the home market at 3¾d. to 4d. per gallon while, for export, price is round 3d. per gallon in buyers' packages at makers' works.

Creosote oil.—Competition is keen and the following can be taken as to-day's market value: Specification oil, 4⅝d. to 4⅞d. per gallon; low gravity, 5¼d. to 5½d. per gallon; neutral oil, 4¾d. to 5d. per gallon; all *ex* works in bulk.

Cresylic acid.—If anything there is more enquiry but prices are still weak. Pale, 97/99%, 1s. 5d. to 1s. 7d. per gallon; dark, 97/99%, 1s. 3d. to 1s. 5d. per gallon; and pale, 99/100%, 1s. 8d. to 1s. 11d. per gallon; all according to quality, *ex* works in buyers' packages.

Crude naphtha is changing hands at 5½d. to 6d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 3½d. to 1s. 4d. per gallon, and 90/190 heavy naphtha is 1s. 1d. to 1s. 1½d. per gallon.

Motor benzole is called 1s. 4d. per gallon.

Pyridine.—90/160 grade is 8s. to 9s. per gallon and 90/140 grade is 9s. to 10s. per gallon.

Benzole Prices

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole..	0	9½	to	0	10	per gall. at works
Motor „ ..	1	3	„	1	3½	„ „ „
90% „ ..	1	4	„	1	4½	„ „ „
Pure „ ..	1	8	„	1	8½	„ „ „

Contracts Advertised To-Day

Gasholder.
Corporation of Glasgow Gas Department. [p. 757.]

Purifier Cover.
Wombwell U.D.C. Gas Department. [p. 757.]

Dewsbury Gas Department

The financial year ended March 31, 1938, of the County Borough of Dewsbury Gas Department was a very good one and the accounts show a gross profit of £21,729. Interest and sinking fund amounted to £13,366, income-tax to £1,970, contributions to capital to £1,860, and net profit to £4,533. Over £5,600 was paid to the relief of rates. The cost of coal carbonized was £20,633, and the receipts from residuals amounted to £21,487. Revenue from gas totalled £42,521, of which £23,130, an increase of over £600, was collected from prepayment meters. The revenue derived from the sale of pure ammonia was over £600, while the sale of benzole produced over £4,000, and tar revenue £2,393. During the past few years the Works have been entirely reconstructed. One of the two gasholders has been renewed while the second gasholder is being renewed at the present time. Over 300 modern 12-light lamps have been erected on the main roads of the Borough and the Gas Department has now over 95% of the street lighting. The increased consumption of gas for street lighting has been gained in the face of keen competition from the Electrical Department. The number of appliances fixed continues to increase and the tariff scheme with gas at 3d. per therm is attracting consumers and proving very popular.

PROTECT WITH

METROTECT

a bituminous paint producing a pleasant satin black finish with highly waterproof and anti-corrosive properties.

Protects steel-work which is continuously or periodically immersed in water. Does not become brittle on prolonged atmospheric exposure. METROTECT flows freely under the brush and can be applied quickly and without effort even in cold weather.

Prices and further particulars from—

SOUTH METROPOLITAN GAS CO.

PRODUCTS DEPARTMENT,
REGIS HOUSE,
KING WILLIAM STREET,
E.C.4.

NEW

Glover-West PLANT FOR BLACKPOOL

This perspective drawing shows the exterior design of the installation of Glover-West continuous vertical retorts ordered by the BLACKPOOL Gas Department for the new Corporation Gas Works to be established at Marton, as it will appear when completed. Interesting and important new features will make this 72-retort plant, with its extensive coal and coke-handling and waste-heat recovery equipment, an outstanding example of modern advances in carbonizing practice.

A carbonizing plant which will be one of the most complete and economical in operation so far erected in this country.

Dignity allied with utility in architectural treatment will be a striking external feature of Blackpool's new Glover-West installation. It will also embody the many advantages and amenities upon which the world-wide prestige of the Glover-West system has been built during 30 years of constant research and development for the advancement of gas production methods.

WEST'S GAS IMPROVEMENT COMPANY, LTD.

MANCHESTER: ALBION IRONWORKS, MILES PLATTING 'Phone: COLLYHURST 2961 : 'Grams: "STOKER, MANCHESTER"

LONDON: COLUMBIA HOUSE, ALDWYCH, W.C.2 'Phone: HOLBORN 4108 : 'Grams: "WESGASCO, ESTRAND, LONDON"

GAS STOCKS AND SHARES

The anxiety as to the outcome of events in Europe has now become world-wide. It is no wonder, therefore, that business on the Stock Exchange last week was seriously affected. Prices were substantially marked down and reached their lowest on Wednesday. The news on Thursday of Mr. Chamberlain's decision personally to interview Herr Hitler certainly stemmed the downward trend and matters took on a more hopeful outlook. Business, however, was practically at a standstill and quotations on the whole eventually closed slightly below Thursday's best. These notes are written before the current week opens; that it will be an historical one there can be no doubt, and if, happily, the major disaster can be averted and some signs are apparent of a permanent settlement of the European situation markets would swiftly respond.

With the exception of Monday last week when a fair number of transactions was recorded, the volume of business in the Gas market has been almost negligible. It has been practically confined to forced sales, and apart from these there have been neither buyers nor sellers. In common with other high-class investment securities Gas Light stocks were marked down, though in several cases the small drop was brought about by a widening of margins. The current situation has certainly had a serious affect on the value of Imperial Continental stock, which fell a further 3 points to 112½. It should not be forgotten, however, that the Company now has important interests in this country, so that a holding at the current price to give a return of about 8¼% on the basis of last year's dividend of 10% is worth consideration, both as regards yield and capital appreciation. South Eastern Gas Corporation £1 shares, South Metropolitan, and South Suburban ordinaries also recorded small depreciations.

On the Provincial Exchanges the two Bristol 4% debenture stocks dropped 2 points each, and Newcastle units closed a fraction easier. Nominal quotations in the Supplementary List remained unchanged.

The Directors of the Bombay Gas Company have declared an interim dividend of 3½%—the same rate as a year ago. Since 1930 the Company has distributed a final dividend of 4½%, making 8% annually, and at this rate the yield at the present time works out at £6 3s.%. A parcel of 1,000 £1 shares is now available at 26s.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 16.	Rise or Fall on Week.
1,767,439	Sept. 5	8	8	Alliance & Dublin Ord. ...	142—152*	...
374,000	June 20	4	4	Do. 4 p.c. Deb. ...	93—108	...
734,733	May 9	5	5	Asscd. Gas & Water U'd'ts Ord.	17/6—19/6	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	19/—21/-	...
444,389	,,	§-/4	4	Do. 4 p.c. Red. Cum. Pref.	19/—20/-	...
296,523	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	16/—18/-	...
500,000	Sept. 5	3½	3½	Do. 3½ p.c. Red. Deb. ...	93—98*	...
558,890	Aug. 22	7	7	Barnet Ord. 7 p.c.	157—162	...
300,000	Apl. 4	1/4⅝	1/9⅝	Bombay, Ltd.	24/6—26/6	...
179,915	Aug. 22	9½	9½	Bournemouth sliding scale ...	195—205	...
590,407	,,	7	7	Do. 7 p.c. max. ...	157—162	...
493,960	,,	6	6	Do. 6 p.c. Pref. ...	133—139	...
50,000	June 20	3	3	Do. 3 p.c. Deb. ...	78—83	...
262,025	,,	4	4	Do. 4 p.c. Deb. ...	98—103	...
335,000	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...
357,900	Aug. 8	7½	7½	Brighton, &c., 6 p.c. Con. ...	142—147	...
649,955	,,	6½	6½	Do. 5 p.c. Con. ...	126—131	...
205,500	,,	6	6	Do. 6 p.c. 'B' Pref.	125—130	...
855,000	Mar. 7	7	8	British Ord.	138—143	...
100,000	June 3	7	7	Do. 7 p.c. Pref	140—145	...
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	,,	4	4	Do. 4 p.c. Red. Deb. ...	94—99	...
450,000	,,	5	5	Do. 5 p.c. Red. Deb. ...	102—107	...
450,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	94—99	...
100,000	22 May'33	6	4	Cape Town, Ltd.	1—2	...
100,000	6 Nov.'33	4½	4½	Do. 4½ p.c. Pref. ...	1¾—3½	...
150,000	June 20	4½	4½	Do. 4½ p.c. Deb. ...	60—70	...
626,860	July 18	6	6	Cardiff Con. Ord.	118—123	...
237,860	June 3	5	5	Do. 5 p.c. Red. Deb.	105—110	...
98,936	Mar. 21	2/-	2/-	Colombo Ord....	1⅝—1¾	...
24,510	,,	1/4¼	1/4¼	Do. 7 p.c. Pref.... ...	23/—25/-	...
739,453	Mar. 21	-/11·48	-/11·48	Colonial Gas Assn. Ltd. Ord.	16/6—18/6	...
296,144	,,	1/3·30	1/3·30	Do. 8 p.c. Pref. ...	23/—25/-	...
1,775,005	Aug. 8	5	5	Commercial Ord.	79—84	...
140,000	,,	—	§13/4	Do. 4 p.c. Red. Pref.	97—100	...
620,000	June 3	3	3	Do. 3 p.c. Deb. ...	72—77	...
286,344	Aug. 22	5	5	Do. 5 p.c. Deb. ...	113—118	...
200,000	,,	—	§30/2	Do. 3½ p.c. Red. Deb.	99—102	...
807,560	Aug. 8	7	7	Croydon sliding scale ...	135—140	...
644,590	,,	5	5	Do. max. div. ...	105—110	...
620,385	June 20	5	5	Do. 5 p.c. Deb. ...	115—120	...
239,000	Aug. 8	5	5	East Hull Ord. 5 p.c.	94—99	...
185,355	Aug. 8	6	6	East Surrey Ord. 5 p.c. ...	116—121	...
176,211	June 3	5	5	Do. 5 p.c. Deb. ...	115—120	...
250,000	July 4	4	8	Gas Consolidation Ord. 'B' ...	22/—23/-	+2
250,000	May 9	4	4	Do. 4 p.c. Red. Cum. Pref.	17/6—19/6	...
9,223,324	Aug. 8	5§	5§	Gas Light & Coke Ord. ...	22/—23/—a	—/3
2,600,000	,,	3½	3½	Do. 3½ p.c. max. ...	78—82	—½
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	98—102	—½
2,993,000	July 4	—	3§	Do. 3§ p.c. Red. Pref. ...	100—103	...
8,602,497	May 23	3	3	Do. 3 p.c. Con. Deb. ...	77—82	—2
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	109—114	—2
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	108—113	—1
700,000	Sept. 5	3½	3½	Do. 3½ p.c. Red. Deb. ...	96—99*	...
270,466	Aug. 22	6	6	Harrogate New Cons. ...	117—122	...
157,500	Mar. 21	1/2⅝	‡1/-	Hong Kong and China Ord. ...	¾—1	...
213,200	Aug. 8	6	5§	Hornsey Con. 3½ p.c. ...	100—105	...
5,600,000	May 9	8	12	Imperial Continental Cap ...	110—115	—3
223,130	July 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	87—92	...
285,242	Aug. 8	8½	8½	Lea Bridge 5 p.c. Ord. ...	164—169	...
11,751	Aug. 22	10	8	Maidstone 5 p.c. Cap. ...	175—185	...
63,480	June 20	3	3	Do. 3 p.c. Deb.... ...	70—75	...
45,000	May 23	†10	†10	Malta & Mediterranean ...	135—140	...
				Metropolitan (of Melbourne)		
392,000	Apl. 1	5½	5½	5½ p.c. Red. Deb.	99—102	...
231,977	Aug. 22	5	5	M.S. Utility 'C' Cons. ...	99—104	...
968,658	,,	4	4	Do. 4 p.c. Cons. Pref.	95—100	...
360,075	June 20	4	4	M.S. Utility 4 p.c. Deb. ...	97—102	...
148,955	,,	5	5	Do. 5 p.c. Deb. ...	113—118	...
675,000	May 9	†6	†6	Montevideo, Ltd.	73—78	...
250,000	Aug. 8	7½	7½	North Middlesex 6 p.c. Con.	14.—147	...
396,160	Aug. 8	5	5	Northampton 5 p.c. max. ...	105—110	...
300,000	Apl. 25	†9	†7	Oriental, Ltd.	147—152	...
468,537	June 3	8	8	Plymouth & Stonehouse 5 p.c.	150—155	...
621,667	Aug. 8	8½	8½	Portsmouth & Gosport Cons.	157—162	...
241,446	,,	5	5	Do. 5 p.c. max. ...	100—105	...
73,350	,,	5	5	Do. 5 p.c. Pref. ...	107—112	...
75,000	,,	4	4	Do. 4 p.c. Pref. ...	94—99	...
114,000	Aug. 8	5	5	Preston 5 p.c. Pref.	104—109	...
247,966	June 3	4	4	Primitiva 4 p.c. Cons. Deb. ...	98—103	...
625,959	July 18	4	4	Do. 4 p.c. Red. Deb. ...	94—99	...
15,000	Sept. 5	6	6	San Paulo 6 p.c. Cum. Pref. ...	8¼—9*	...
441,275	Apl. 25	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	21/—22/-	...
460,810	Mar. 21	-/10⅝	-/10⅝	,, ,, 4½ p.c. Cum. Pref.	19/6—21/6	...
133,201	Aug. 22	5	8½	Shrewsbury 5 p.c. Ord. ...	127—132	...
9,000	June 3	4	‡4	South African Ord.	4¼—5½	...
1,371,752	Aug. 22	1/2½	1/2½	South East'n Gas Cn. Ld. Ord.	21/—23/-	—1
871,636	,,	-/10⅝	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	20/—22/-	...
498,818	,,	4	4	Do. 4 p.c. Cum. Pref. ...	18/—20/-	...
450,000	Aug. 8	4	4	Do. 4 p.c. Deb.	99—102	...
150,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	94—97	...
6,709,895	Aug. 8	6	5	South Met. Ord.	104—107	—1
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	128—133	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	95—100	...
1,895,445	June 20	3	3	Do. 3 p.c. Deb.	77½—80½	...
1,000,000	July 4	5	5	Do. 5 p.c. Red. Deb. ...	110—113	...
600,000	,,	—	§31/-	Do. 3½ p.c. Red. Deb. ...	99—102	...
1,543,795	Aug. 8	6	6	South Suburban Ord. 5 p.c. ...	115—120	—1
512,825	,,	5	5	Do. 5 p.c. Pref.... ...	108—113	...
500,000	,,	4	4	Do. 4 p.c. Pref.... ...	95—100	...
250,000	,,	3½	3½	Do. 3½ p.c. Red. Pref. ...	97—100	...
888,587	June 3	5	5	Do. 5 p.c. Deb.	115—120	...
250,000	,,	4	4	Do. 4 p.c. Deb.... ...	96—101	...
200,000	Aug. 8	3½	3½	Do. 3½ p.c. Red. Deb. ...	93—98	...
427,859	Apl. 25	1/2½	9½	S. Western Gas & Water Ord.	16/—18/-	...
160,523	,,	-/10½	-/10½	Do. 4½ p.c. Red. Cum. Pf.	19/—21/-	...
110,000	June 3	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...
750,541	Aug. 8	5½	5	Southampton Ord. 5 p.c. ...	106—111	...
148,836	June 3	4	4	Do. 4 p.c. Deb.	95—100	...
350,000	Aug. 8	5½	5½	Swansea 5½ p.c. Red. Pref. ...	106—111	...
94,000	June 3	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...
1,076,490	Aug. 8	6§	6§	Tottenham and District Ord.	126—131	...
409,835	,,	5½	5½	Do. 5½ p.c. Pref. ...	117—122	...
62,235	,,	5	5	Do. 5 p.c. Pref. ...	110—115	...
371,850	June 3	4	4	Do. 4 p.c. Deb. ...	96—101	...
85,701	Apl. 25	6	6	Tuscan 6 p.c. Red. Deb. ...	95—101	...
1,131,550	Aug. 22	6	4	U. Kingdom Gas Cor. Ord. ...	18/6—20/6	...
1,051,280	May 9	4½	4½	Do. 4½ p.c. 1st Cum. Pref.	19/6—21/6	...
762,241	,,	-/1·15	4	Do. 4 p.c. 1st Red. Cum. Pf.	19/—21/-	...
745,263	June 3	4½	4½	Do. 4½ p.c. 2nd Non-Cum.Pf.	16/—18/-	...
1,000,000	Sept. 5	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—98*	...
373,939	Aug. 8	7	7	Uxbridge, &c., 5 p.c.	132—137	...
133,010	,,	5	5	Do. 5 p.c. Pref. ...	108—113	...
1,371,138	Aug. 8	7	7	Wandsworth Consolidated ...	135—140	...
2,525,768	,,	4	4	Do. 4 p.c. Pref. ...	98—101	...
1,343,964	June 3	5	5	Do. 5 p.c. Deb. ...	115—120	...
383,745	,,	4	4	Do. 4 p.c. Deb. ...	97—102	...
400,000	,,	—	§25/-	Do. 3½ p.c. Red Deb.	97—102	...
558,342	Aug.	7	€7	Watford and St. Albans Ord.	133—138	...
200,000	,,	5	5	Do. 5 p.c. Pref. ...	108—113	...
200,000	,,	5½	5½	Do. 5½ p.c. Pref. ...	118—123	...
200,000	June 3	4	4	Do. 4 p.c. Red. Deb.	96—101	...
100,000	,,	3½	3½	Do. 3½ p.c. Red Deb.	94—99	...

a.—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Cont.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations Sept. 16.	Rise or Fall on Week.
202,152	Sept. 5	5	5	Ascot Ord.	101—106*	...
128,182	July 18	5	5	Do. 5 p.c. Pref.	108—113	...
31,035	Aug. 22	–/4⅛	–/4⅛	Associated Utilities 4 p.c. Pref.	16/—18/–	...
100,000	Dec. 13	...	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...
17,000	Aug. 22	8	8	Bognor Orig. Ord. 'A' ...	155—165	...
62,210	,,	8	8	Do. New Addl. 'A' ...	155—165	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	145—155	...
37,440	Aug. 8	10	10	Cam. Univ. & Town 10 p.c. max.	188—198	...
125,970	,,	7	7	Do. 7 p.c. max.	133—138	...
39,025	,,	5	5	Do. 5 p.c. max.	97—102	...
96,410	July 18	4½	4½	Cardiff 4½ p.c. Pref.	95—100	...
150,000	Aug. 8	4	4	Croydon 4 p.c. Pref.	97—100	...
130,000	June 20	4	4	Do. 4 p.c. Deb.	97—102	...
65,000	Aug. 8	8½	7½	Eastbourne 'A' 5 p.c. ...	140—145	...
198,000	,,	7	6	Do. 'B' 5½ p.c.	115—120	...
112,312	,,	5	5	Do. 5 p.c. Pref.	107—112	...
130,000	June 20	5	5	Do. 5 p.c. Deb.	112—117	...
24,000	Aug. 8	8½	8½	Great Yarmouth 8½ p.c. max.	43—48	...
59,400	,,	7½	7½	Do. 7½ p.c. max.	33—38	...
51,160	June 3	5½	5½	Do. 5½ p.c. Deb.	121—126	...
152,600	Sept. 5	9	8	Guildford Cons.	162—168*	...
54,055	,,	5	5	Do. 5 p.c. Pref.	107—112*	...
68,250	June 3	5	5	Do. 5 p.c. Deb.	107—112	...
156,600	Aug. 22	7½	7½	Hampton Court Cons. ...	131—136	...
80,000	Aug. 8	4	4	Lea Bridge 4 p.c. Pref. ...	94—99	...
60,000	,,	6	6	Do. 6 p.c. Pref.	121—126	...
94,876	June 3	4	4	Do. 4 p.c. Deb.	95—100	...
73,620	Sept. 5	8½	8½	Luton Cons. 'A'	153—163*	...
107,960	Mar. 21	4	5½	Mid Kent Ord.	88—93	...
230,940	Aug. 8	10	10	Oxford & District Ord. ...	195—200	...
47,112	,,	5	5	Do. 5 p.c. Pref.	106—111	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	107—112	...
126,193	May 9	7½	7½	Peterborough Ord.	135—145	...
64,990	Sept. 5	6½	7½	Redditch Ord....	118—128*	...
166,850	Aug. 8	8	8	Romford Ord....	142—147	...
60,000	,,	4	4	Do. 4 p.c. Pref.	97—100	...
44,000	Mar. 21	5	5	Do. 5 p.c. Deb.	111—116	...
25,570	Aug. 8	5½	5½	Rugby 5½ p.c. Pref.	120—125	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	104—109	...
42,750	June 3	5½	5½	Do. 5½ p.c. Deb.	118—123	...
110,950	Aug. 22	8	8	Ryde Ord.	140—150	...
270,086	Sept 5	7	7	Slough Ord.	128—133*	...
21,000	June 20	5	5	Do. 5 p.c. Deb.	110—115	...
28,872	May 9	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	19/—21/–	...
28,866	Sept. 5	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	18/—20/–	...
117,228	Aug. 8	7	5	Swindon Cons.	102—107	...
60,425	June 3	5	5	Do. 5 p.c. Deb.	112—117	...
64,380	June 3	5	5	Torquay & Paignton 5 p.c. Pref.	107—112	...
130,000	Aug. 8	8	5	Wakefield Ord.	116—121	...
81,650	,,	5	5	Do. 5 p.c. max.	100—105•	...
82,000	Aug. 8	6	6	Weymouth Ord.	103—108	...
98,384	Aug. 22	6	6	Wolverhampton 6 p.c. Pref.	118—123	...
160,000	June 20	5½	5½	Do. 5½ p.c. Rd. Db.	105—110	...
90,000	June 20	5	5	York 5 p.c. Red. Deb. ...	104—109	...
133,640	July 18	6½	6½	Yorktown (Cam.) 5 p.c. Cons.	118—123	...
120,000	,,	5	5	Do. 5 p.c. Pref.	105—110	...
35,000	June 3	5½	5½	Do. 5½ p.c. Deb.	120—125	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 16.	Rise or Fall on Week.
347,756	July 18	6	5	Bath Cons.	118—120	...
1,667,250	July 18	5	5	Bristol, 5 p.c. max.	112—114	...
120,420	June 3	4	4	Do. 1st 4 p.c. Deb. ...	99—101	–2
217,870	,,	4	4	Do. 2nd 4 p.c. Deb. ...	99—101	–2
328,790	,,	5	5	Do. 5 p.c. Deb.	119—122	...
274,000	Aug. 8	5	5	Newport (Mon). 5 p.c. max....	97—99	...
13,200	Mar. 21	7	8⅛	Pontyp'l Gas & W. 10 p.c. 'A'	13—14	...
13,600	,,	5	6	Do. 7 p.c. 'B'	12—12½	...
40,000	,,	5	6	Do. 7 p.c. 'C'	12—12½	...
140,778	Aug. 8	5	5	Weston-super-Mare Cons. ...	108—110	...
64,338	June 20	4	4	Do. 4 p.c. Deb.	100—102	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	151—154	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 16.	Rise or Fall on Week.
157,150	Aug. 8	4½	5	Chester 5 p.c. Ord.	109—111	...
92,500	June 20	4	4	Do. 4 p.c. Pref.	95—99	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	87—90	...
41,690	,,	4	4	Do. 4 p.c. Red. Deb. ...	97—101	...
2,167,410	Aug. 22	6	6	Liverpool 5 p.c. Ord.... ...	121—123	...
245,500	June 20	5	5	Do. 5 p.c. Red. Pref. ...	97—102	...
306,083	July 18	4	4	Do. 4 p.c. Deb.... ...	100—102	...
106,280	Aug. 8	10	10	Preston 'A' 10 p.c.	198—208	...
188,219	,,	7	7	Do. 'B' 7 p.c.	131—141	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 16.	Rise or Fall on Week.
122,577	Aug. 8	8	8	Blyth 5 p.c. Ord.	161—162	...
732,000	Aug. 22	5	5	Hartlepool G. & W. Cn. & New	94—95	–½
2,061,315	Aug. 8	5⅛	5	Newcastle & Gateshead Con.	22/6-23/–a	–/1½
682,856	,,	4	4	Do. 4 p.c. Pref. ...	99—100	...
776,706	June 20	3½	3½	Do. 3½ p.c. Deb. ...	88½—89½	...
277,285	May 9	5	5	Do. 5 p.c. Deb. '43 ...	104—106	...
332,351	Aug. 22	6	6	Sunderland 6 p.c. max. ...	135—136	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 16.	Rise or Fall on Week.
542,270	Aug. 8	9	6	Derby Con.	133—143	...
55,000	June 3	4	4	Do. 4 p.c. Deb. ...	100—105	...
20,000	June 20	5	5	Long Eaton 5 p.c. Pref. ...	10—12	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 16.	Rise or Fall on Week.
10,000	Aug. 8	10	10	Great Grimsby 'A' Ord. ...	205—215	...
6,500	,,	10	10	Do. 'B' Ord. ...	205—215	...
79,000	,,	10	10	Do. 'C' Ord. ...	195—205	...
1,806,339	Aug. 22	6½	6½	Sheffield Cons.	139—141	...
95,000	July 4	4	4	Do. 4 p.c. Deb.	101—103	...

a The quotation is per £1 of Stock. • Ex div.

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